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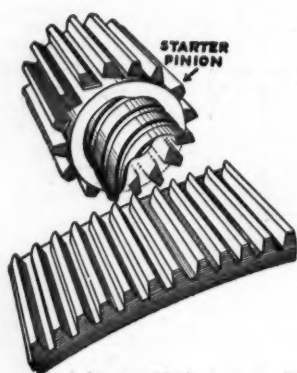
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No. 22

Service Must Be Fundamental Part of Automotive Organization

Should be conceived as contributing to economical
transportation; not as merely sale of parts.
Successful convention in Dayton.

By W. L. Carver

SERVICE as embodied by the factory and its service department, the dealer and service garage, must become a more fundamental part of a sound business organization before the motor vehicle can reach its full usefulness and consequent sales value. This was the underlying thought running throughout the entire joint meeting of the service committee of the National Automobile Chamber of Commerce and the Society of Automotive Engineers, held in Dayton, Nov. 20 and 21. Whether the discussion was centered for the moment on any detail, such as the flat-rate system, electrical repairs or parts prices, every speaker quickly arrived at the necessity for greater cohesion with a common viewpoint and a better, broader business policy.

The conception of service as contributing to better, more economical transportation was urged in opposition to the narrow idea based upon the sale of repair parts. The automobile manufacturer's success is founded upon the customer's opinion of the transportation service which he has received. Nationwide advertising campaigns and sales drives may have their momentary effect, but in the end the customers' transportation, its original and current charges, will be the determining factor. In arriving at this broad policy, aspects and evils of present practice were given the acid test to determine their inherent weaknesses.

Discussion pointed to the necessity of imbuing every department with the common viewpoint of providing the customer with an economic vehicle having an economic service burden. The older practice, in which the engineer hands a design to the production department, this department in turn makes delivery

to an abstract sales department, which unloads the thing on the customer and gets the money, must give way to one in which all are pulling together to satisfy the ultimate user. Although present as an undercurrent, the greatest doubt as to putting this policy into effect seemed to be the question of whether the "big boss" could be sold on the idea.

From the engineering department, closer contact and better appreciation of the service man's problems were asked, that cars might be designed for service as well as production. A touch here and there on the original design that cost but little would go far to relieve many of the service problems. Design whys and wherefores should be placed at the service man's command. From the design angle, the necessity for greater accessibility and simplicity were urged. In return, the service man can provide the engineer with current information which will indicate performance over the entire field. One of the features of the meeting was a paper on the possibilities of providing this information.

FROM the commercial standpoint, it was pointed out that service must be sold at a predetermined fair price, and that, in the broad sense, prices must satisfy the customer. At present the high prices of repair parts interfere with satisfactory operation of this policy. A well organized flat-rate system is bound to be deficient as long as the customer feels that he is being "gyped" for repair parts. Another contribution to the success of the flat-rate system can be made by installation of more adequate educational methods. The so-called expert was decried and the need for well trained men having the business and

mechanical ability for thorough diagnosis of trouble was urged.

The economic folly of giving service rather than selling it as a commodity was emphasized. Service, however, can be sold only when every one concerned knows that it is real service and not just another means for extracting a profit from the customer. To make service real, parts and labor prices must be brought to an economic level. This can be done only when broad-visioned engineering, consistent production quality and sound business methods are all applied toward the same end. Then service will be the big brother of sales.

With the second-hand or used car problem looming as important as it does at present, the service side of the industry occupies a key position. The resale, as well as the original sales value of a car, is almost wholly dependent upon the character of service rendered. Advertising propaganda will not create this value, but the customer will, through his satisfaction in fair-priced, adequate transportation service.

About 150 representatives of the factory service departments and of the Society of Automotive Engineers attended the meeting. Following the sessions visits were made to the Delco Plant, McCook Field, General Motors Research Laboratories and the National Cash Register Company. At the last named plant a complete inspection was made of the central service department and training school. Policies and their concrete effects, as well as the various forms of service effort, were explained in detail.

Meetings were held at the Dayton Engineers' Club, all being presided over by F. A. Bonham, chairman of the N. A. C. C. Service Committee. The first speaker was Charles H. Paul, chief engineer of the Miami Conservancy District and president of the Engineers' Club. Paul welcomed the visitors to Dayton and extended the facilities of the clubhouse to them.

N. A. C. C. Service Men Outline New Platform

As a part of the policy of increasing the activities and educational effort of the N. A. C. C. service committee, a service platform of definite policies has been formulated by a committee appointed for that purpose. This platform, which is reprinted here, was presented by H. R. Cobleigh, secretary of the N. A. C. C. service committee. One important item in this statement reads:

A plan toward which nothing has been done but which has great possibilities we feel is to cooperate with the National Automobile Dealers Association in the holding annually of a two-weeks (more or less) school for dealers and service association executives. The ideas which these dealers and service association executives could get to carry back and put to work in this way would have wonderful effect on the automobile trade all over the country. Our promotion of service associations has revealed a general weakness of dealer associations, cities in which they have been real successes being few and far between. It would do very much to improve trade practices if more and better trade and service associations could be established.

Discussion centered largely upon this service congress and exhibition features of the spring meetings. After being advised of the sanction of this feature by representatives of the National Automobile Dealers Association and the Automobile Equipment Association (A. E. A.), these members adopted the platform as a whole.

As a part of the policy of greater safety effort and

education, the morning session was concluded by a paper and demonstration on the subject of "Evils of Head Lamp Dimming and Instructions on Regulation," presented by R. E. Carlson of the U. S. Bureau of Standards. He demonstrated that the requirements of good lighting were three in number, as follows:

1. An adequate amount of light.
2. Correct distribution.
3. No glare.

Although these requisites are well known to the manufacturers, the various engineering and trade associations, they are not fulfilled by the majority of the cars on the road.

Service More Than Sale of Parts, Says Kettering

In a characteristic talk C. F. Kettering analyzed the things which contribute to service based upon fundamental economics, at the same time pointing out several factors of present engineering and service practice which depart from basic principles. His talk was predicated upon two assertions; namely, that service in all of its phases contributes to more satisfactory operation and that real service is more than the mere selling of repair parts. The achievement of these ideas at the factory will be more nearly reached when the sales and service organizations are united and closely correlated with the engineering and cost departments.

He pointed out that 65 per cent of the potential and even the present car market is to be found in the so-called hick towns. Unless the owners in this region are to get real economically sound service, the industry is bound to suffer. When the owner buys a car he expects a certain amount of transportation service which, due to natural wear and accidents, involves a certain amount of service work. This must be performed for reasonable labor charges and repair parts prices must be fair. The owner may desire to forego a portion of this transportation and sell the car, as often occurs. The car immediately becomes a part of the second-hand market problem, its value is dependent upon the possibilities of maintaining good condition by reasonable service charges. Finally, the resale value of any car in any community is primarily dependent upon the class of service rendered.

Kettering hammered the type of engineering which, for example, devotes its energy to increasing mileage per gallon by a few per cent when this element constitutes a relatively minor factor in a profit and loss statement covering the annual operation of a car. On the average, about \$80 per year is required for gasoline. When this item is compared with the usual repair charges resulting from present-day service methods and engineering practice, it becomes insignificant. Much remains to be accomplished in the way of providing greatly improved durability and accessibility.

He derided the so-called expert who infects the modern garage, each having a single nostrum, such as grinding valves or putting on some special carburetor, for every trouble from the radiator to the rear axle. A diagnostician having some real sound knowledge of the inner workings of the automobile was recommended as the correction of this evil. Such a man, and there are already a few of his kind, would inspect the car thoroughly and then give the customer a real diagnosis accompanied by an accurate estimate of service expense.

He criticized the repair parts price list, stating that as long as present prices remain, even the flat rate sys-

tem is just another form of "gypping." There is no reason why manufacturers should continue demanding the use of ball bearings, etc., from their stocks at five to ten times the cost when purchased from regular supply houses. Again, why should the manufacturer demand a thousand per cent profit on service parts which he manufactures? Surely the overhead due to additional handling and clerical work does not approach this requirement. Kettering cited the largest car manufacturer as about the only one having a reasonable repair parts price policy and suggested that this factor might have something to do with the prosperity of that organization.

In conclusion he brought home the fact that while to the producing organization a car represents the aggregate of a highly complicated piece of machinery, to the user it is an entity, and trouble of any kind, great or little, is real trouble.

The service man and every other part of the organization must bear this fact in mind in design and in all dealings with the owner. Due to the status of the second-hand market and its relation to adequate service and reasonable service charges, the service man now holds the key position in the automobile industry. Well-organized service will ultimately sell more cars than the usual sales methods. The service department is at present unsatisfactory and must be made an integral part of the parent industry by better business methods and a campaign of education, which will include every one from the big boss down to the smallest dealer and the ultimate customer.

Flat Rates Beneficial to Industry and Public

The afternoon session of Nov. 20 was devoted largely to consideration of the flat rate system and service information with their relations to the car designer. In the first talk entitled "What Lessons of Value to the Engineer Has the Flat-Rate System Developed?" Don T. Hastings emphasized the need for greater simplicity and accessibility, also the need for a broader oversize parts policy. He began by pointing out that all design is a compromise with the ideals of engineering excellence and the most complete accessibility tempered by the commercial necessity of meeting a certain specified price range.

Although efforts of the engineer are limited by this element, great progress has been made, and newer designs on the whole indicate increasing attention to such details. In laying down a design, many factors must be considered, each having a relative influence on the final product. Among these are engineering, characteristics, production qualities and the service element. Up to date, Hastings infers that, in the last analysis service requisites have had about 10 per cent influence on the design.

From the practical standpoint, much has been accomplished by the grouping of tappets into brackets, and in providing greater accessibility of the various units, but until more attention is paid to the removal of the engine from the chassis, and also removal of pistons and rods from the engine, much remains to be accomplished. Details like these contribute to inordinate service charges, even when the flat-rate system is in effect. When the flat-rate charge is based on the removal of the radiator for slight repairs to the interior of the generator, the result is bound to be excessive.

A broader policy covering oversize parts was also urged. Oversize pistons and piston pins are customary practice. The repair man and the customer would benefit

greatly by the extension of this policy to include tappets, valve stems and a number of pressed-in bushings.

Concluding, Hastings stated that the real success of the flat-rate system was largely dependent upon well arranged shops with every facility for the assistance of the employees. Quick delivery must be maintained between the stock room and the repair floor. He also advocated closer relationship between the service department and the distributor to bring about a clearer understanding of the common problem of satisfying the customer.

Entirely new possibilities along the lines of providing the engineer with field data from the records of the service department were opened up by the paper of O. T. Kreusser. A chart form for tabulating service information as illustrated in Fig. 1 graphically illustrated the possibilities of his paper, "Providing the Engineer with Service Data to Improve Design," which is abstracted as follows:

The customer is already giving the preference, everything else being equal, to the car manufacturers who show evidence that they realize their responsibility to the customer and provide him with those facilities and that attention he may need during the life of that car. That means the service man must continually broaden his outlook to prepare for the improvements in service that the customer has a right to expect. In other words, we must be prepared to furnish each year better service, prompter service, and at a less cost.

The service experience in the field provides a definite channel to bring to the designing and production organizations the information that should be most valuable in producing an improved product. We must remember that the elimination of unnecessary service due to failures of an avoidable nature is just as important as rendering good service economically at all times.

The designer should be provided with a prompt, reliable means indicating just what is being done to the cars in all the fields that the service organization represents.

The results obtained with the same car in different sections of the country are sufficiently different to warrant very close analysis before the conditions demanding change of design in an existing product are understood.

Reducing Transport Cost

The continued growth of the automobile industry is predicated on producing individual transportation at less cost with equipment that provides more reliable functioning. For this reason the actual service one is obtaining with cars in the customer's hands today and tomorrow, not two or three years back, is of utmost importance to every manufacturer.

As one looks over the detail records of operation of many different makes of cars in the same service, the outstanding points are that most maintenance troubles are not of a major character, but are multiplications of detail troubles.

The record of piece parts shipped in itself is of not much value to the engineer in so much as it does not give definite facts as when the pieces are used, or whether all work done depended upon the factory as the source of supply for such parts needed. It leaves out the big factor of making repairs and adjustments that do not require new piece parts.

It is not intended that the service department should be in position to supply the detail information necessary to make an engineering change of design or material, but they should, at all times, have a record that acts very similar to the signal system of a railroad in that it indicates when excessive trouble is experienced rela-

tive to a particular detail or function of the product, as compared with previous experiences.

By assisting the individual garage in the field to develop those records that are most useful to conduct their business in the businesslike way, the service departments can help to the extent of providing the field with suitable information and printed material that will help them to be in position to furnish the information to the factory that will in turn be instrumental in making their job more agreeable by providing the customer with a more satisfactory product.

We can never hope to depend upon the field service stations to provide detailed records such as copies of every work order covering the work they do. This involves entirely too heavy a clerical expenditure both in the field and at the home office.

Job Analysis

The service station in itself should be so organized that they keep a running record of the exact nature of every job. This can be measured in the terms of billing, hours, or simply in a qualitative measure indicating what work was done regardless of the time or cost involved.

The gradual expansion of the flat-rate system automatically cares for the cost and time analysis. What the engineer is particularly interested in is whether or not difficulty is experienced and how frequent with any particular component of his automobile.

One of the activities of the General Motors Research Corp. is to carry on extensive car tests. We are primarily interested in finding the good points and shortcomings of different cars under operation conditions that are comparative.

These cars are run over roads that represent typical all around conditions of city and country driving.

Tests are conducted on the basis of 25,000 or 50,000 miles of service and a detailed record is kept of just what is done and what is found from day to day.

To make this information readily available to the engineer we find a chart system permitting comparison of the details one car to another as being a most constructive and useful record.

It is this comparative record every service department should teach the service stations to keep, to provide that knowledge of what is going on, and incidentally have it available through weekly returns to the service manager for many constructive purposes.

Through the process of elimination we found that all references pertaining to the parts and functioning of a car can be included under about 125 headings. These headings, you will note, are broken up into major classifications, dividing a car into the following components: engine, electrical, clutch and transmission, running gear, chassis, and body. Under these major classifications we have subdivided the more detailed components so that, regardless of what trouble is experienced, there is a particular place on the chart to indicate by means of a dot that trouble had been experienced with that particular function of the car.

Engineer's Part in Service

Another angle of the relationship between the service man and the engineer in improving flat-rate service operation was presented by J. Willard Lord in his paper, "How the Engineer Can Cooperate to Make the Flat-Rate More Successful." Lord's remarks will be published in a later issue of AUTOMOTIVE INDUSTRIES. He urged that car and truck factories give some serious attention to designing tools for use in service stations. A real step forward in providing economical and rapid service could be done in this way, he said.

Hallock Talks on Evils of Crankcase Dilution

Crankcase dilution was the topic of the first portion of the Wednesday morning session, the subject being discussed from viewpoints of aid to both engineer and user. In the first paper, "The Evils of Crankcase Dilution—How to Educate the Public," E. R. Hallock outlined the requirements of correct lubrication and the various means for disseminating this information to the dealer and the user. The problem of education took the foremost position. He urged the necessity of informing the user of the evil effect of dilution and more important, dirty lubricant with sludging or emulsification of the lubricant of almost equal vital importance.

After pointing out that marine and motorcycle engines are lubricated by dilution of the fuel with $2\frac{1}{2}$ to 12 per cent of oil, Hallock showed typical examples of automobile engine trouble resulting from dilution of the lubricant ranging from 15 to 30 per cent. This being the case, he averred that the dirt, carbon from the piston head, iron and bearing dust in the oil must be the greatest factor contributing to trouble after dilution has taken place. To avoid the possibilities of dilution he recommended the following set of instructions:

1. Avoid excessive use of the choke.
2. Use radiator cover in cold weather.
3. Avoid idling for long periods.
4. Keep engine in good mechanical condition.
5. Drain oil at frequent intervals:
After every 1000 miles in the summer;
After every 500 miles, or once each month, during the winter.
6. Do not flush the crankcase with kerosene as it frees the dirt which is carried in the gummy deposit in the interior of the engine. All of this dirt cannot be washed out. Use warm light oil.

Preventing Sludging

Sludging or emulsification, Hallock stated, is caused by the water and sulphur products of combustion entering the crankcase and uniting with the lubricant. To prevent sludging he recommended the following instructions:

1. Drain a cupful of oil while the engine is warm. Water being of higher specific gravity than the oil will collect at the drain plug, which is the lowest point of the crankcase and therefore flow out first when the plug is released.
2. Use a radiator cover or thermostat in cold weather. The water content following combustion in a cold engine is high and excess amounts of fuel must be used to provide sufficient volatility.
3. Clean oil strainer screen after every 100 hours' service.
4. Use high test gasoline.
If a benzol mixture is used, it must be clean and free from impurities.
5. Clean out old sludge. Do not flush but drop pan and wipe the case out thoroughly.

Three possible improvements in design for the improvement of engine lubrication were advanced by T. A. Waerner's talk on "What Can the Engineer Do To Help the Public?"

1. Greater accessibility of draining facilities.
At present but a half-dozen makes of cars are fitted with devices which permit oil drainage without the necessity of crawling under the car to get at a screw drain plug. The lack of this feature is one of the greatest contributions toward troubles arising from faulty lubricant.

2. Greater accessibility of vital parts such as the oil screen.

The oil pump screen requires somewhat frequent cleaning if correct lubrication is to be maintained, but this portion of the oil line is ordinarily placed so that the bottom pan must be dropped before any attention may be given.

3. Improved crankcase design.

Sound Service Maxims Are Given by W. L. Wise

In the concluding talk of the morning session, W. L. Wise of the National Cash Register Company described the service policies and activities of that company. The subject, "Selling Service," presented a picture of the most effective service effort which is capable of adaption in the automotive industry, due to its thorough organization and sound business policy. The complete paper will be published in a later issue of AUTOMOTIVE INDUSTRIES.

Careful Study Needed

Wise pointed out that service is a fundamental part of business policy. Unless this side of an enterprise is furthered with the same painstaking thought that goes into any other department, the entire business cannot achieve its full development. Adequate, satisfactory service is founded upon a most careful campaign of education, reaching every individual connected in any way with the commodity which changes hands.

Service must be rendered upon an economic basis and must not be unprofitable to either the manufacturer or user. Each party along the line has an obligation to fulfill, the manufacturer to the customer and the customer to the manufacturer.

The sale of service, he stated, is founded upon five requirements, as follows:

1. The Company must establish its reputation with its service representatives.
2. The Company must try to sell its service and its servicemen's work to their users.
3. The user must be taught his obligation to the mechanism he has bought.
4. The serviceman must be able to sell his service to the user so that after the job is completed, the bill is willingly paid and the user maintains a friendly disposition toward the Company and retains a high regard for the mechanism he is using.
5. In the case of the automobile, perhaps this is more important than almost any other device, because cars on the street are either an advertisement or a detriment, and car users on the street are not always satisfied to hide their feelings.

Some of the high lights of Wise's speech are the following:

Requirements Outlined

When service falls down, sales fall down.

Many corporation officers have no conception of the character of proper service.

The service man should be trained thoroughly at the plant; his work, through the medium of his reports, should be checked up constantly. If any falling off or unusual characteristic is shown, he should be brought into the plant and given additional instruction.

The service man is a business man; his training should be 50 per cent mechanical and 50 per cent commercial. He must be instilled with a thorough respect and enthusiasm for the company and its policies. If he is not thoroughly imbued with these characteristics he is an enemy inside of the organization and should be rooted

out. He must take pride in the service rendered and can only do this when he is familiar with the company's policies and proud of them.

The customer must pay a predetermined fair price for the service received and feel satisfied that he has received a square deal.

The service man must not guess at the cause of trouble and its remedy. Diagnosis constitutes a real part of service effort. The service man must have the training and mental equipment to discover any trouble and proceed with its correction by the shortest route.

Telephone service or advice as to the correction of trouble over the telephone is a powerful factor in selling the service idea. Great economies of time and effort accrue to both parties.

A service garage should be operated to take care of users rather than as a source of additional profit.

The factory organization sees the inside of its product, while the customer sees the outside, therefore two entirely different products are made.

Problems of the repairshop occupied the spotlight during the session of Wednesday afternoon. W. A. Francis forwarded a very terse prescription for "What Part Can the Engineer Play in Helping to Reduce Repair Costs by Eliminating the Need of Costly Tools?" He stated that the greatest saving is to be made by the adoption of a standardized car design that tends toward greater simplicity and accessibility by evolutionary steps. Following this policy, the service man can purchase adequate equipment with the assurance of long usage. Service tools are costly only when they are not used or when their cost must be amortized due to obsolescence.

Repair Shop Problems

Low-grade equipment, ignorance of electrical knowledge, and shortsighted design pertaining particularly to the feature of accessibility were advanced as the greatest drawbacks of the electrical repair man by P. J. Durham in his paper on "Electrical Repair Problems as Encountered in the Field." Durham stated his belief that not one factory service manager or engineer out of fifty appreciated the problems involved in taking care of his own car's electrical equipment.

He condemned many features of present practice, including the following:

- Poorly fitted or troublesome lamp doors.
- Focussing devices either totally lacking or unreliable.
- Lenses without indexing means for retention in one position.
- Inaccessible and inferior grade wiring.
- Inaccessible switch and fuse connections.
- Minute connector posts and nuts.
- Iron machine screws.
- Variety of battery posts and terminals, most of which can not be tightened with any assurance.
- Variations in the sizes of battery containers.

Many of Durham's complaints were borne out by J. W. Tracy in his paper, "What Can the Engineer Do to Simplify Electrical Repairs?" Tracy said, however, that motor car design had become well crystallized before the need for elaborate electrical equipment was felt. Consequently, many car engineers subordinated the installation and accessibility of electrical units to other details. There is no need for further types of electrical equipment unless they involve fundamental advances. Already there are more than 1000 types of electrical equipment on the market when four standardized types would fulfill the needs of the entire field. A dealer cannot hope to maintain a repair stock in the face of the wide variation which now holds.

Advertising Problems Become Complex as Industry Grows

Responsibilities of men in charge of publicity are increasing, say speakers at N.A.C.C. meeting.
Automotive news values discussed.

ADVERTISING of motor vehicles imposes great responsibilities upon the men handling it and their burdens are becoming heavier constantly as the problems of the industry become more complex.

This was, in substance, the thought which ran through the two-day meeting of the National Automobile Chamber of Commerce advertising managers held at Cleveland last Thursday and Friday. One day was devoted to passenger cars and the other to trucks, because it was recognized that the issues involved differ greatly. A desire to co-operate in the solution of common problems was voiced by all the speakers and the discussions were perfectly frank.

"What Is News?" was the subject assigned to Myles F. Bradley, publicity director of Durant Motors, Inc. He was unable to be present and his paper, first on the program at the passenger car session, was read by John C. Long, secretary of the committee.

Bradley declared that nine out of ten automotive publicity departments are flooding the newspapers with columns of stuff about which the public doesn't care. They are spending thousands of dollars to fill editorial waste baskets. The authors of this material frequently try to exert pressure on editors through advertising departments to have their material printed. Even if they are successful, what good does it do them to get printed articles in which the readers of the papers are not interested, he asked. They are merely destroying the value of newspaper publicity.

Publicity Viewed as "Bunk"

The average reader looks upon most automotive publicity as mere "bunk," Bradley asserted, and this reacts on the paid advertising which appears alongside the publicity. There is little excuse for this condition because plenty of real news is available to make automobile pages interesting. Such material would be welcomed by the editor.

If the writers of news of this character expect it to be read they must be brief. He would prefer five lines which would be read to a column which wouldn't. He prefers to do the blue penciling himself before his stories go out and he cuts out every superfluous word, with the result that he has little difficulty in getting it into print. His space volume is not large, but papers seldom fail to print the items he sends them.

Edward S. Jordan, who presided, said he had been successful in getting valuable publicity by discussing subjects which are constructive and of interest to the public. Subjects include transportation, highways, safety and the "saturation point." He tries to get the point of view and the papers on his list, which in-

clude those in which his company advertises, usually find such material worth printing.

A. B. Batterson of Buick declared one of the greatest evils is in attempting to force papers in which a company advertises to use its publicity. His company has divorced advertising and publicity entirely. Newspapers are running their own business, he said, and they are expected only to give value received for the advertising space they sell. Expecting a paper to give free space as a bonus with a certain amount of advertising is no more justifiable than it is to expect an automobile manufacturer to give extra equipment to each car purchaser. More than 1000 papers have asked for the Buick publicity service. They have been told it has no bearing whatever on the purchase of advertising space, and the results have been entirely satisfactory.

Advertising Rates

William James of Hudson brought up the question of advertising rates and said that in many cases they were discriminatory because papers base them on publicity just as they do their theatrical business. Dealers are likely to favor those papers which give them most publicity even if they are the poorer papers. If a paper is worth while it sells so much space. They "don't throw in a spare tire, and that's what publicity is for the newspaper."

James contended that automotive advertising managers should get together for an analysis of advertising rates to see that all are getting fair treatment and that they are not being discriminated against. Dealers don't always realize the value of the best papers. He suggested the appointment of a committee to consider the rate question, with a compilation of rates charged different advertisers in the same field and in different fields, as well as line rates. Chairman Jordan said such a committee would be appointed later.

E. LeRoy Pelletier of Rickenbacker said that anything is news which is new to the reader, and that editors usually are the poorest judges of what is new because there is little which is novel to them. He has seen weak papers become strong because of the character of their news.

Responsibilities Increase

"The Relation of Advertising and Sales" was the subject of George M. Graham, vice-president in charge of sales of the Chandler Motor Car Co.

Advertising is a most intricate science with diversified problems, he said. Automobile advertising especially imposes a heavy burden of responsibility upon the advertising manager because it is very hard to check the results of the huge expenditures. It has a speculative aspect

because, while we know what it does in the long swing, it is difficult to trace the results of any specific campaign.

The industry has grown 100,000 per cent in the present century, from a registration of 13,000 to 13,000,000. This demonstrates that the money spent for advertising has been justified.

Another responsibility of the advertising manager, Graham said, is that he speaks for the good name of his company. His copy carries the name of his company. It speaks for a definite policy of price, sales and service. The name of a successful automobile company represents infinite good will. Even Ford has come to a recognition of the value of paid advertising.

All ads are good ads, Graham said, but some are better than others. If we could advertise in every issue of every publication the problem would be solved. Discrimination is what is hard.

Choosing Mediums Important

Advertising gets nowhere without the cooperation of everybody in the organization. Picking mediums is a most important responsibility. It is possible to do a lot with a little money, he asserted. He believes thoroughly in the budget system and would increase or decrease the appropriation according to the increase or decrease in the volume of sales.

The time to advertise big is when the market is big. Then determine what kind of people you want to reach and decide what mediums will serve best to reach them. The sales manager must depend on the advertising manager and the advertising agencies for recommendations about mediums. Newspapers give the quickest results and national mediums keep your name alive even in sections where you have no representation. The value of advertising is in direct proportion to the number of dealers. He felt that small production companies might better localize their efforts and that the trade paper looms up as a means for reaching dealers.

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Advertising Problems Become Complex as Industry Grows

Responsibilities of men in charge of publicity are increasing, say speakers at N.A.C.C. meeting.

Automotive news values discussed.

ADVERTISING of motor vehicles imposes great responsibilities upon the men handling it and their burdens are becoming heavier constantly as the problems of the industry become more complex.

This was, in substance, the thought which ran through the two-day meeting of the National Automobile Chamber of Commerce advertising managers held at Cleveland last Thursday and Friday. One day was devoted to passenger cars and the other to trucks, because it was recognized that the issues involved differ greatly. A desire to co-operate in the solution of common problems was voiced by all the speakers and the discussions were perfectly frank.

"What Is News?" was the subject assigned to Myles F. Bradley, publicity director of Durant Motors, Inc. He was unable to be present and his paper, first on the program at the passenger car session, was read by John C. Long, secretary of the committee.

Bradley declared that nine out of ten automotive publicity departments are flooding the newspapers with columns of stuff about which the public doesn't care. They are spending thousands of dollars to fill editorial waste baskets. The authors of this material frequently try to exert pressure on editors through advertising departments to have their material printed. Even if they are successful, what good does it do them to get printed articles in which the readers of the papers are not interested, he asked. They are merely destroying the value of newspaper publicity.

Publicity Viewed as "Bunk"

The average reader looks upon most automotive publicity as mere "bunk," Bradley asserted, and this reacts on the paid advertising which appears alongside the publicity. There is little excuse for this condition because plenty of real news is available to make automobile pages interesting. Such material would be welcomed by the editor.

If the writers of news of this character expect it to be read they must be brief. He would prefer five lines which would be read to a column which wouldn't. He prefers to do the blue penciling himself before his stories go out and he cuts out every superfluous word, with the result that he has little difficulty in getting it into print. His space volume is not large, but papers seldom fail to print the items he sends them.

Edward S. Jordan, who presided, said he had been successful in getting valuable publicity by discussing subjects which are constructive and of interest to the public. Such subjects include transportation, highways, safety problems and the "saturation point." He tries to get the reader's point of view and the papers on his list, which in-

clude those in which his company advertises, usually find such material worth printing.

A. B. Batterson of Buick declared one of the greatest evils is in attempting to force papers in which a company advertises to use its publicity. His company has divorced advertising and publicity entirely. Newspapers are running their own business, he said, and they are expected only to give value received for the advertising space they sell. Expecting a paper to give free space as a bonus with a certain amount of advertising is no more justifiable than it is to expect an automobile manufacturer to give extra equipment to each car purchaser. More than 1000 papers have asked for the Buick publicity service. They have been told it has no bearing whatever on the purchase of advertising space, and the results have been entirely satisfactory.

Advertising Rates

William James of Hudson brought up the question of advertising rates and said that in many cases they were discriminatory because papers base them on publicity just as they do their theatrical business. Dealers are likely to favor those papers which give them most publicity even if they are the poorer papers. If a paper is worth while it sells so much space. They "don't throw in a spare tire, and that's what publicity is for the newspaper."

James contended that automotive advertising managers should get together for an analysis of advertising rates to see that all are getting fair treatment and that they are not being discriminated against. Dealers don't always realize the value of the best papers. He suggested the appointment of a committee to consider the rate question, with a compilation of rates charged different advertisers in the same field and in different fields, as well as line rates. Chairman Jordan said such a committee would be appointed later.

E. LeRoy Pelletier of Rickenbacker said that anything is news which is new to the reader, and that editors usually are the poorest judges of what is new because there is little which is novel to them. He has seen weak papers become strong because of the character of their news.

Responsibilities Increase

"The Relation of Advertising and Sales" was the subject of George M. Graham, vice-president in charge of sales of the Chandler Motor Car Co.

Advertising is a most intricate science with diversified problems, he said. Automobile advertising especially imposes a heavy burden of responsibility upon the advertising manager because it is very hard to check the results of the huge expenditures. It has a speculative aspect

because, while we know what it does in the long swing, it is difficult to trace the results of any specific campaign.

The industry has grown 100,000 per cent in the present century, from a registration of 13,000 to 13,000,000. This demonstrates that the money spent for advertising has been justified.

Another responsibility of the advertising manager, Graham said, is that he speaks for the good name of his company. His copy carries the name of his company. It speaks for a definite policy of price, sales and service. The name of a successful automobile company represents infinite good will. Even Ford has come to a recognition of the value of paid advertising.

All ads are good ads, Graham said, but some are better than others. If we could advertise in every issue of every publication the problem would be solved. Discrimination is what is hard.

Choosing Mediums Important

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secondary as to the primary market. If you look over the used car advertising in the Sunday papers, he said, you will find that dealers are following the same custom that the original trader used in the early days. Thousands of dealers are following identically the same custom.

Used Car Problem Universal

You can talk all you want to, he said, about keeping the factories out of the used car mess, but you can't do it. As dealers fail, one by one, and it is necessary to fill their places with factory branches, it will become very much a factory problem. The public has sold more automobiles in the last year, he asserted, than the automobile dealers. It would be possible to sell 14,000,000 cars next year if some satisfactory means could be found for disposing of the automobiles now in use. Those companies which don't build secondary value for their products will suffer in the long run, he asserted.

The manager of the Cleveland Used Car Bureau declared that 43,250 used cars had been sold in Cleveland up to Oct. 1 of this year, as compared with 31,000 new cars. He said the bureau had spent \$47,000 in advertising used cars in September and \$37,000 in October. He knew of one dealer who had spent \$93 on used car advertising for every new car he sold, but another who stressed new cars in his advertising had moved his used cars at an advertising cost of about \$3 each. He held that too much money is spent for used car advertising.

It was agreed in the discussion that all factories are thinking a great deal about the used car problem and that they propose to give their dealers all the assistance in their power.

Jordan asked for views on whether or not the market for open cars is passing, but few opinions were advanced on this subject. He believes that lower prices for closed jobs has concentrated attention on them, with largely increased sales to people who always have wanted cars of that type. The open car has suffered because of this concentration on models of the other type and he believes the advertising man will have to find a market not only for used cars but open cars.

Pelletier remarked that factories lose a lot of money by advertising to get prospects into sales rooms where they are driven out by the poor approach of salesmen. He believes that automobile salesmen should be high caliber men on a salary sufficient to give them mental content. Because of the dearth of good men it is possible advertising may have to carry the brunt of the sales burden.

R. H. Crooker of Federal presided at the Friday session, devoted to questions of peculiar interest to the advertising managers of truck companies.

Service Methods Described

Robert F. Wood of the Autocar company outlined what his company has done in renewing and rebuilding its products with results highly satisfactory both to the company and the users of its products. Operations of this character are carried on largely through branches. The best way to sell a used truck is through classified ads, he said, but they should be carefully written and give a complete description of it.

Henry R. Trumbower, economist for the United States Bureau of Public Roads, told what the Government is doing in the way of highway and traffic researches. He dwelt especially upon the results of surveys made in Connecticut and California, where strikingly similar conditions have been found to prevail. He mentioned also the intensive investigations undertaken by the Government in relation to the transportation of various agricultural commodities over the highways and the marketing of them.

"Opportunities for Cooperation in Parts and Completed

Vehicle Advertising" were considered by Ezra W. Clark, chairman of the Advertising Managers Council of the Motor and Accessory Manufacturers Association. In outlining what can be done in this direction he said:

"I would say that there is immediate and urgent necessity for emphasis in all of our advertising on strict compliance with all automotive and traffic laws and regulations to the end that we eliminate the irresponsible and criminally negligent driver and reduce to a minimum the fearful toll of deaths chargeable to reckless driving.

"Second, that the vehicle manufacturer should utilize, advertisingly, the tremendous investment in service and servicing facilities provided by the parts and accessory manufacturers.

"Third, advertising cooperation between the vehicle and parts manufacturer in the fight against the 'pirate' part.

"Fourth, the elimination of 'orphan' cars and trucks from the industry and the establishment of sources of supply from strong, sound parts manufacturers."

Cooperation Reduces Accidents

Clark contended that proper cooperative advertising on the part of car, truck and parts manufacturer would reduce to a minimum the toll of automobile fatalities.

"We must do something more than merely produce and sell vehicles," he said. "We must educate the masses in their use. Every time an irresponsible driver runs down and slays a pedestrian, young or old, he injures your business and mine and raises in that locality a weight of resentment that in time will result in a flood of restrictive if not conscriptive laws aimed at our industry."

One of the most animated discussions of the session related to the value of trade and vocational papers. It seemed to be the general opinion that space in such papers should be bought on the basis of the value of their editorial contents. It was felt that while there are some excellent papers in the field there are others which are merely hangers-on. Generally speaking, it seemed to be the idea that a greater amount of discretion should be used in the selection of vocational and trade publications and that those which are giving the greatest service to their readers are the ones which can be used to the greatest advantage.

Cuba Is Good Accessory Market

THE position of Cuba as a preferential market for American automobile accessories is evidenced by the fact that from 90 to 95 per cent of all such accessories and replacement parts sold in the country come from the United States. The continuation of this condition, says Assistant Trade Commissioner Howard H. Tewkesbury, Havana, in a report to the Department of Commerce, however, will depend largely upon the attention which American manufacturers give to this excellent and convenient market, for German and French competition has already begun to make itself felt somewhat in certain lines.

American firms follow various methods in handling their Cuban business. Some operate through agents in New York or Habana, or through their own branches in the island, and others sell direct to the larger dealers and jobbers. An important business is also done through the mails. The majority of sales are made against sight drafts drawn for 30 or 60 days. A factor which is favorable to importations from the United States is the 25 per cent ad valorem duty placed upon them, as contrasted with a 31.25 per cent duty which is levied on importations from other countries.

Bureau of Standards Makes Definite Checks on Brake Performance

Relative effectiveness of various arrangements and operating means are graphically recorded. Use of front wheel type does not double rate of deceleration. Hand variety seldom good. Surprising values for friction coefficient between tire and road obtained.

By Herbert Chase

FEW of the numerous valuable tests conducted by the Bureau of Standards have yielded such timely and important data as those dealing with brake performance and brake materials which we are privileged to publish here for the first time.

Thanks to hard work by W. S. James and his associates, laboring with inadequate funds and under circumstances which would have discouraged less determined and persistent investigators, we now have some unprejudiced and reliable data on brake performance under a wide variety of conditions such as two and four-wheel applications, foot and hand operated, effect of speed on deceleration, effect of tire inflation on braking, relative performance of cold and hot brakes and the like.

It should be understood that these data are only comparative in most cases and are limited in other respects, especially by lack of time and funds to make them as comprehensive and conclusive as would have been liked. Nevertheless they are a highly important addition to our meagre knowledge of braking conditions and undoubtedly will serve to clear up many points.

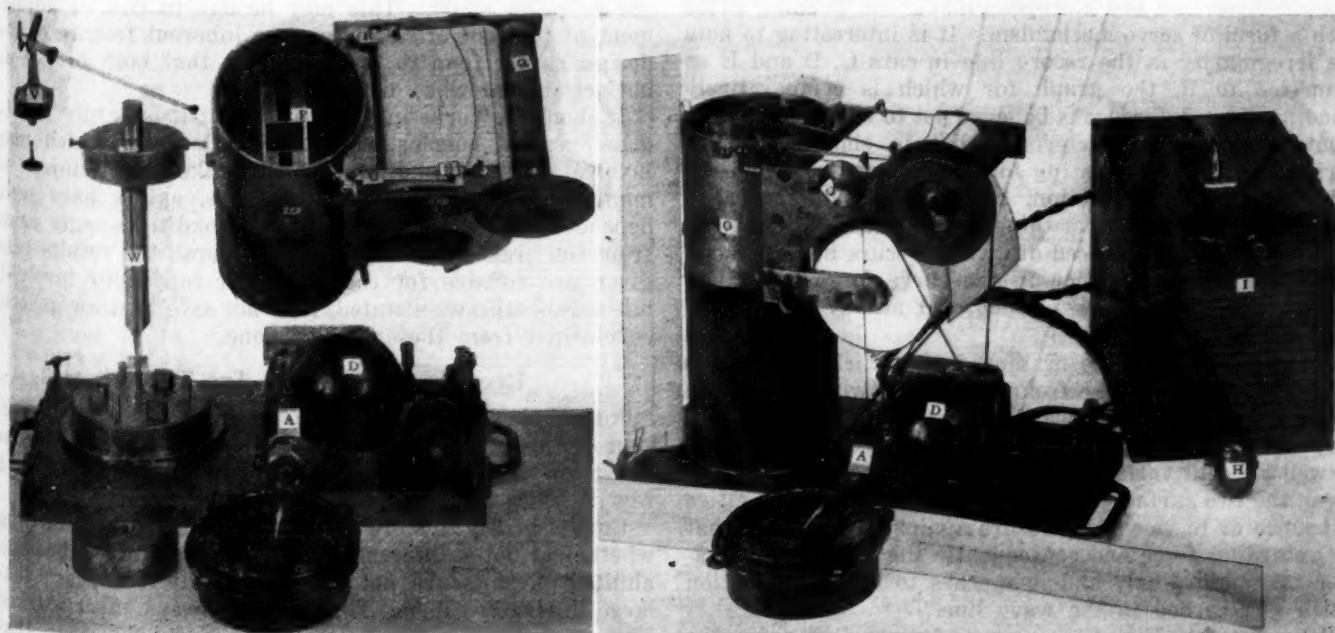
Some form of device for measuring rate of deceleration or retarding force is necessary to make a comparison of brake performance. A simple, rugged, yet sensitive and accurate instrument of this kind did not exist, hence it was necessary to design and build such an instrument.

This has been done and the result will be described later. It is desirable first to outline some of the results obtained by the use of this decelerometer, as it is called.

Fairly typical records from the B. of S. decelerometer are reproduced in Fig. 1. They show the rate at which a certain car, A, with rear wheel brakes only, stopped on a dry concrete surface from an initial speed of 10, 20, 30 and 40 m.p.h. In each case the brakes are applied with the car moving at uniform speed, that is with zero rate or retard. Time is measured in each case from instant of application, that is zero on the horizontal time scale.

Immediately the car starts to decelerate, the recording pen moves upward to a point which represents an approximately constant deceleration value. Here it remains as the paper passes under it tracing a somewhat wavy line until the car comes to rest and the pen again immediately moves to zero deceleration. Time to stop is measured in seconds on the horizontal scale and rate of deceleration in ft. per sec. per sec. on the vertical scale. An alternative vertical scale reading the retarding force in pounds per ton or any other similar unit can be added on the same graph if desired in place of the ft. per sec. per sec. scale.

Fig. 1 shows this important fact: that at least within certain limits, decelerating rate (and force) are practically independent of speed, other conditions remaining the same. In this case the rate is approximately 10 ft. per sec. each



Two views of the recording decelerometer developed by the Bureau of Standards and used in obtaining the graphical records here published for the first time

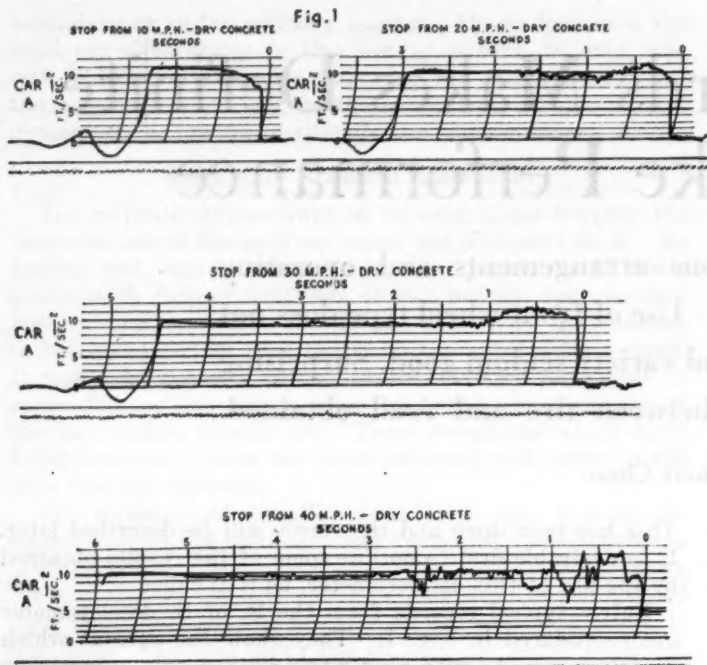
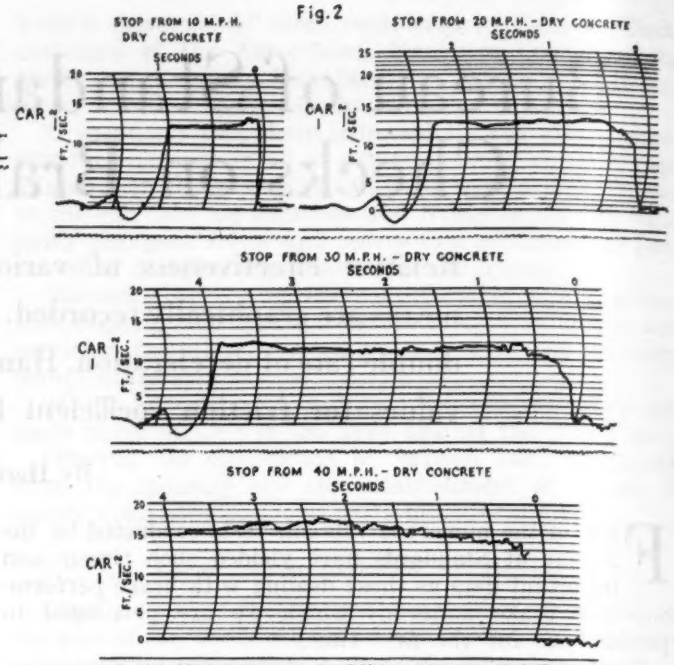


Fig. 1—Typical deceleration diagrams from an American car fitted with two-wheel brakes. Rate of deceleration is practically constant at all speeds from 10 to 40 m.p.h.

Fig. 2—Similar diagrams from a car fitted with four-wheel brakes



second, produced by a retarding force of 620 lb. per ton car weight.

Fig. 2 gives similar data for car I, which is equipped with four-wheel brakes. It will be noted again that the rate of deceleration is approximately the same at 10, 20 and 30 m.p.h., namely, about 12 ft. per sec. per sec., but averages over 15 ft. per sec. per sec. when stopping from 40 m.p.h. Up to 30 m.p.h. the rate of deceleration is thus little more than 20 per cent higher than with two-wheel brakes on car A, which is of about the same size and in about the same price class.

How Four-Wheel Brakes Perform

In Fig. 3 are given records obtained from another American car, B, with four-wheel brakes of a different design from those on car I, and from other four-wheel brake cars, of both American and European make, car D being fitted with a form of servo mechanism. It is interesting to note the irregularity in the record line in cars C, D and E as compared to B, the graph for which is comparatively smooth. This difference is believed not to be due to instrumental error or characteristics but to show an actual variation in the decelerating force, presumed to be due to variations in spring action, tire deformation and road irregularities among other things. In any case, it is known that the rather pronounced dip which occurs in the second half-second of deceleration in the curve for car C at 10 m.p.h. is due to the wheel passing over an oily spot on the road surface.

It is evident that the braking force which retards the car must come entirely from the road (wind resistance being left out of consideration) and that this force will vary with variations in the pressure between tire and road as well as with variation in the coefficient of friction between the two surfaces. Road irregularities cause the tire to bounce or to vary its pressure against the road so that the retarding force and consequently the rate of deceleration vary accordingly and it appears to be this variation which is recorded in the wavy line.

Reproduced in Fig. 4 are records for car G showing the comparative effect of stopping with (a) four-wheel brakes, (b) rear wheel brakes only and (c) front wheel brakes

only. In this case it will be noted that, in stopping with all four brakes the deceleration averaged slightly over 20 ft. per sec. per sec., with rear wheel brakes only, about 12 ft. per sec. per sec. and with front brakes only, between 13 and 14 ft. per sec. per sec. all from an initial speed of 15 m.p.h.

In all cases here recorded the brakes were applied fully and held on hard during the stop, with engine declutched.

Comparisons between foot operated service brakes and hand operated emergency brakes are also shown in Fig. 4, cars, H, M, and P. In the case of cars H and M it will be seen that the hand brake is about half as effective as that operated by the foot, which is about a normal condition, at least on American cars. In the case of car P, however, the hand brake, which operates on the rear wheel drums, is more effective than the foot brake which is on the propeller shaft. This may be due to lack of adjustment of the foot brake or to some inherent feature of the design rather than to the mere fact that both brakes do not act on rear wheel drums.

It should be borne in mind, also, that it is hardly fair to draw general conclusions from single tests which may involve unusual conditions. All brakes are subject to many variables and retardations are, as we have seen, dependent upon the road and other conditions quite aside from the brakes themselves. In general, the results here given are reliable for the particular conditions involved, but unless otherwise stated, it is not safe to draw general conclusions from these results alone.

Records Here Given Are Typical

Records here reproduced are, however only a small fraction of those made to date and when general conclusions are given they are based on large numbers of tests only a few of which are here recorded.

Curves in Fig. 5 were obtained with a view to learning whether or not a difference in tire inflation affects braking ability. Results are not conclusive, but it appears that large differences in pressure do not always effect marked changes in deceleration. It is to be noted, however, that soft tires may assist springs materially in maintaining contact between tire and road surface.

Fig. 6 is one of several records made to determine the effect of temperature on brake performance. It is seen that the cool brakes are considerably more effective, a fact which is confirmed by other tests.

In Fig. 7 are plotted the results of several tests of four-wheel brakes based upon data which appeared in *La Vie Automobile* and presumably was furnished to that publication by the manufacturers of the cars tested. These data are given for what they may be worth. They were plotted in the form shown by the Bureau of Standards with a view to learning whether there might be any agreement as to the effect of speed on retardation and what coefficients of friction are involved.

It is seen at once that there is a surprising lack of agreement as to the relation between speed and rate of deceleration and a great variation in the coefficient of friction. In only one case does the deceleration rate remain even approximately constant at different speeds and in this case the coefficient of friction is slightly over 1.1. In other words the force necessary to stop the wheel from sliding is fully 10 per cent greater than the weight on the wheel.

Finding it hard to credit this extraordinary coefficient James set about making some rough tests calculated to determine whether such a coefficient could be obtained between any two surfaces one of which is the tread of a pneumatic tire. Time funds and equipment were lacking for any elaborate tests calculated to duplicate service conditions, hence the following simple expedient was tried with a full knowledge of the fact that the data obtained applies with certainty only to the conditions of the particular test and may not be representative of service conditions, especially in view of the fact that, in service, rubbing speeds are much higher.

How Friction Coefficient Was Measured

Several sections of new tire casings measuring about a foot in length were procured. These had a variety of treads, most of them rough or of the "non-skid" variety, and the remainder straight ribbed treads. Each sample was placed on the surface over which the test was to be made and on it was set a 50 lb. cast iron test weight. A pull was then applied through a spring balance in a direction parallel to the surface and readings were made of the pull required to just start the sample moving and to keep

it in motion at a speed corresponding to a slow walk. Dividing the pull by the weight gave, of course, the coefficient of friction.

Results of these tests are both interesting and surprising. The coefficients obtained are set down in Table I, from which it will be seen that the surfaces tested included: concrete, asphalt, clay and pebbles, sandy clay, loose macadam, glass and other materials. In some cases the tests were made with the surface dry and in some with the surface wetted with water or oil. Tests were made with the samples drawn straight ahead, that is parallel to the plane of the tire, and transversely to this plane.

Results of Friction Tests Summarized

A summary of the results follow:

1. In practically all cases the coefficient at the start of motion (of the entire sample, not the stretching which precedes motion of the entire piece) is less than that during continuous motion,—a result which is quite different from that usually applying in tests in which friction coefficients are measured.

2. On clean wetted surfaces, the coefficient is, in some cases, higher than on the same surfaces dry. This is true on concrete and in some cases on asphalt. James is of the opinion that the slippery conditions often encountered on hard surface roads, especially when they are wet, is due to the presence of a film of some foreign substance which, in effect, acts as a lubricant.

3. Coefficients as high as 0.80 are quite general and of 0.90 or above not at all unusual. The coefficient was 1.00 on one piece of rough concrete and actually reached 1.16 on dry plate glass in one case! The lowest coefficient found on any road surface among those tried was 0.54 on wet oiled asphalt.

4. Friction in motion transverse to the plane of the tire is usually about the same as that parallel to the plane and the configuration of the tread appears to have little if any effect on hard surface roads. It was found, however, that composition of tread rubber had a marked effect upon coefficient of friction on hard smooth surfaces.

It must again be emphasized that the foregoing results are not the whole story and do not apply necessarily to service conditions at higher rubbing speeds. It may be and probably is true that conditions are altered when friction between tire and road is used as the retarding

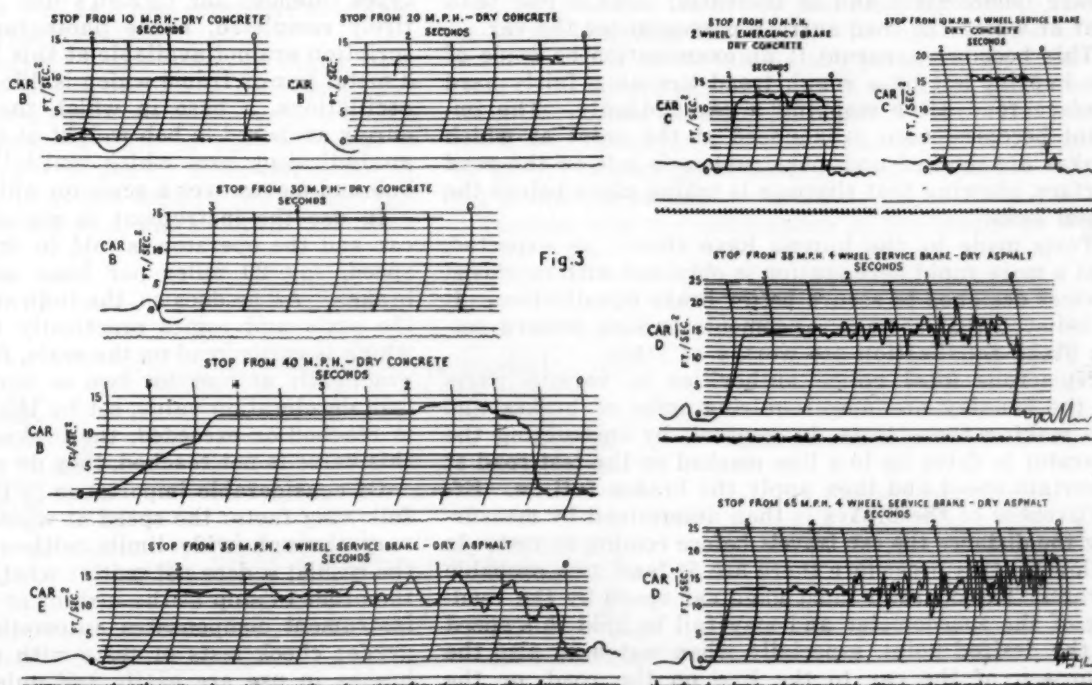


Fig. 3—Deceleration diagrams from four cars, both American and foreign made, all of which are fitted with four-wheel brakes. Note comparative smoothness of curves from car B as compared to those from other cars. Car D has servo mechanism

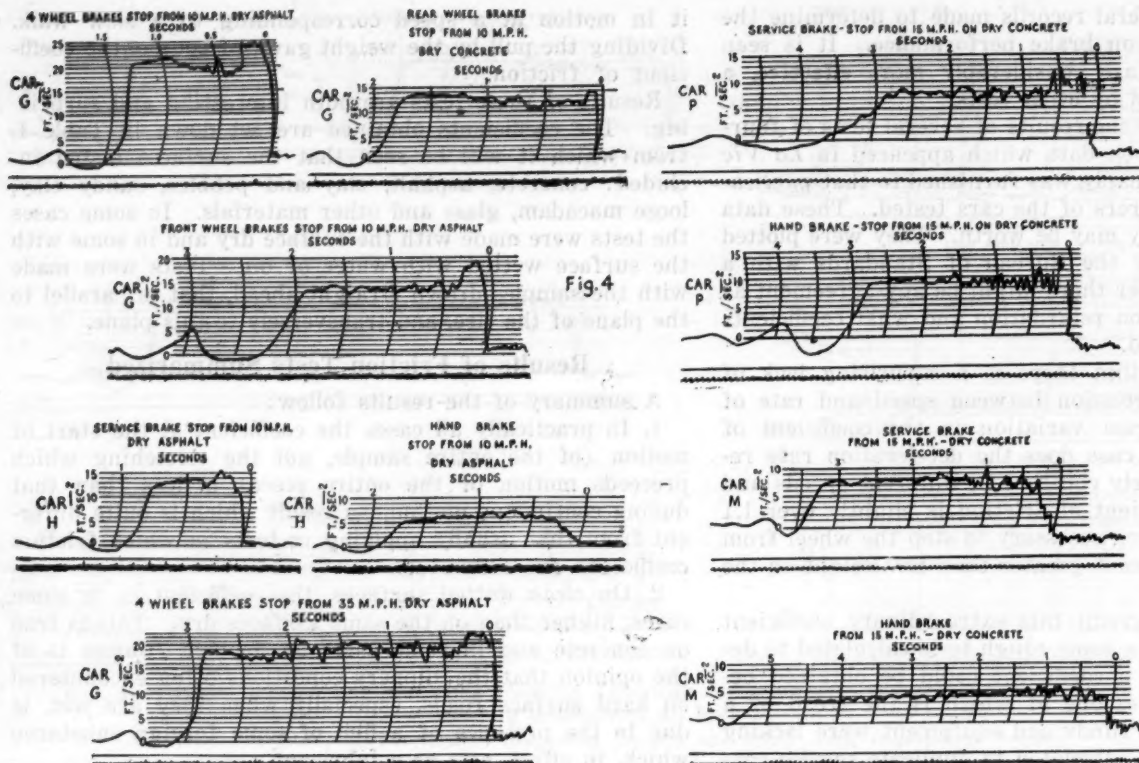


Fig. 4—Decelerometer graphs showing relative effectiveness of various brakes, on the same as well as on different cars. Results are not necessarily comparable in an absolute sense but are substantially correct for the particular brakes under the particular conditions which applied in each test

force to decelerate a car as it is in braking, for in this case the energy absorbed is converted into heat which may be sufficient in quantity and applied at a sufficiently high temperature to melt rubber and thus alter the coefficient. It is hoped to make further tests at a later date under conditions which more closely approximate service conditions.

A common misapprehension pointed out by James is that which assumes that there is no slipping between tire and road until the wheels which are being braked are locked. The fact of the matter is that slippage occurs immediately upon sudden application of the brakes and continues until the vehicle is brought to rest whether the wheels are locked or not. Although the wheel continues to roll, probably in most cases until the vehicle stops, the peripheral speed of the wheel begins to decrease immediately and is thereafter always less than that at which the road surface passes under the car.

This becomes apparent if an examination be made of the imprint left by a rough tread tire on a fairly hard surface road after stopping a car suddenly. The imprint becomes more pronounced at the point at which brakes are applied and more rubber is left on the road surface, showing that slippage is taking place before the wheel locks.

Tests made by the bureau have shown, as expected, that a more rapid deceleration is obtained with improved devices designed to secure better brake equalization. It is believed that some arrangements looking toward better brake equalization are worthy of study.

Numerous local police authorities in various parts of the country are now requiring tests of brakes and are making these tests, in general, by instructing the operator to drive up to a line marked on the test road at a certain speed and then apply the brakes full on. Effectiveness of the brakes is then determined by measuring the distance the car travels before coming to rest. In following this procedure there are at least two probable errors. The operator must gage car speed by the reading of the speedometer and may fail to hold this speed at the desired point, especially when watching also the approach of the car to the line on the road, or the

speedometer itself may not be in order. In the second place he is likely to put on the brakes either too soon or too late.

To avoid these difficulties the Bureau of Standards staff has undertaken to design and build a simple, inexpensive and rugged instrument which will measure directly and with certainty how effective the brakes are. At least three instruments of this class have been constructed and all of them operate on the same principle and with substantially identical mechanism consisting of a simple inverted pendulum supported on a rod a portion of which is necked at one point to act as a spring against which the pendulum is deflected by inertia forces and an indicating arm which swings over a suitably calibrated scale.

The two simplest of these instruments are indicating types intended for laymen's use. They are not yet entirely completed, hence photographs and complete description are not available at this time. They each have a metal box or frame which is filled with oil to damp out oscillations, a base in which the pendulum rod is securely anchored, a bob weight at the top of this rod and an indicating arm which multiplies the motion of the bob and moves over a scale on which readings are taken.

In use the instrument is placed on the floor of the car and the operator is told to drive at any convenient speed, say 20 miles per hour and then to apply the brakes. As he does so, the indicating arm moves out on the scale and comes practically to rest at some point which is easily read on the scale, for the pointer remains practically at rest for two or more seconds. If a certain deceleration value, set by the ordinance, let us say, is reached or exceeded, the brakes pass the test, but if this value is not reached, they do not pass.

Of considerable importance in this connection are the following facts: the speed at which the test is made can vary through wide limits without materially affecting the result; it does not matter whether the operator obeys the order to stop at the instant at which it is given; the instrument compensates automatically for variation in grade; check tests or tests with either or both sets of brakes in use are easily and quickly made; no special

skill in handling the instrument is required, the instrument is applicable to any vehicle, regardless of size and weight, and does not even require attachment to the vehicle.

Instruments of this character can be calibrated to read in feet per second per second deceleration, decelerating force exerted by brakes per ton or other unit of vehicle weight or in feet to stop from a given speed. Reasons for this and for the characteristics mentioned in the preceding paragraph will be apparent from the following description of a recording instrument built on exactly the same principle but in slightly different form and the explanation of the theory on which it operates. It should be understood that the indicating instrument for laymen's use is far simpler than the recording instrument, although working on the same principle. The apparent complication of the recording instrument is due entirely to the recording features.

Two photographs of the recording decelerometer are shown in accompanying cuts. The bob weight, B, is carried on the rod W, which is necked at Z to form a stiff spring about 0.07 in. thick and $\frac{3}{4}$ in. wide. The lower end of the rod is anchored in the base, which is set on the floor of the car with its long dimension parallel to the direction of motion. Vanes attached to the bob are arranged to dip into small reservoirs filled with oil and carried inside the tube G, which screws over the boss in which the rod W is anchored. The oil reservoirs act as dashpots, which damp but do not otherwise constrain motion of the bob.

Carried on the bob is a pin which engages with a slot in one arm of the recording pen, which is hinged on the stationary bracket V and causes this pen (which would be simply an arm or a pointer in the case of an indicating instrument) to move over a scale in contact with the paper roll. This is all that is required in an indicating instrument and, of course, a simpler arrangement of the elements mentioned, as well as a less expensive assembly, can be used in that type if desired.

For purposes of studying brake action in detail, however, it is desirable to have a recording instrument and the recording mechanism employed in this case is shown also in the photographs. A strip of unruled paper is fed between friction rolls driven by a six-volt motor D, worm gearing and the cord belt seen in the photograph. Another similar motor drives a shaft shown just below

Table I—Coefficients of Friction Between Tire Treads and Various Surfaces at Slow Speeds.

Tire Sample	Surface	Coefficient of Friction			
		Start	Slide	Ahead	Crossways
Average of 14 samples with various treads	Dry concrete road.....	0.72	0.80	0.72	0.80
	Flooded concrete road....	0.81	0.94	0.78	0.94
	Dry plate glass	0.81	1.16	...	...
	Rough dry concrete	0.90	1.00	...	...
	Varnished desk top	0.74	0.88	...	...
	Dry concrete road	0.70	0.80	0.62	0.80
	Drawing paper	0.79	0.76	...	...
	Flat rubber	0.76	0.76	...	...
	Dry concrete floor	0.66	0.66	...	...
	Fiber pressboard	0.64	0.65	...	...
One sample with "non-skid" tread	Woolen blanket	0.53	0.62	...	...
	Sandy clay and pebbles...	0.64	0.60	...	...
	Wet glass	0.32	0.34	...	...
	Water on concrete.....	0.76	0.98	0.80	0.96
	Water on clean asphalt...	0.80	0.90	...	...
	Dry clean asphalt	0.82	0.86	...	...
	Dry clean concrete.....	0.80	0.84	...	...
	Moist sandy clay	0.70	0.84	0.64	0.74
	Fine loose macadam	0.70	0.70	...	...
	Oiled asphalt	0.60	0.64	...	...
Another sample with "non-skid" tread	Wet oiled asphalt	0.54	0.60	...	...
	Flooded concrete road....	0.76	0.94	0.72	0.96
	Dry concrete road	0.72	0.80	0.72	0.76
	Dry concrete floor	0.64	0.72	0.62	0.72
	Moist sandy clay	0.60	0.68	0.82	0.80
	Fine loose macadam	0.60	0.64	...	...
	Dry glass	0.54	0.55	0.39	0.45
Sample with ribbed tread					

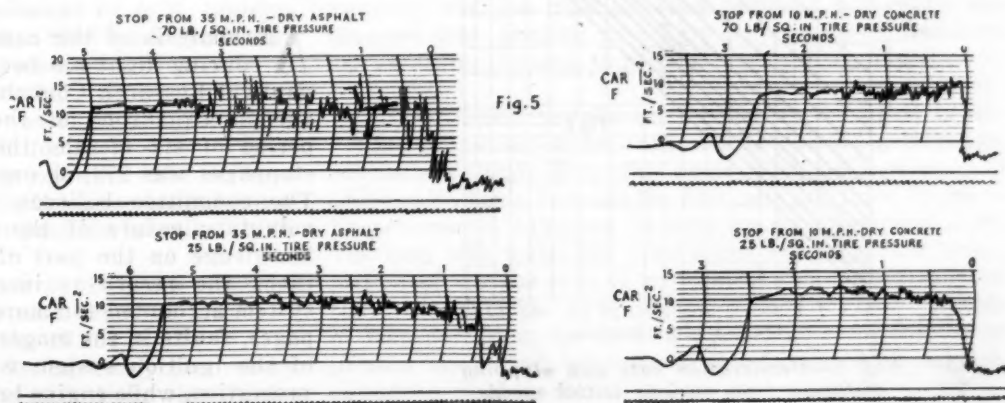
the letter A. To this shaft is attached a chronometric tachometer. On the same shaft is a cam which causes a cam follower, the end of which is seen just above the letter A, to reciprocate once each revolution. To the follower is attached a wire which passes over the pulley C and causes the pen S to trace a saw tooth line at the edge of the paper. This line becomes a time scale when the speed noted on the tachometer is taken into consideration. The speed of the motor employed is such in this case as to cause the time pen to make about twenty oscillations per second.

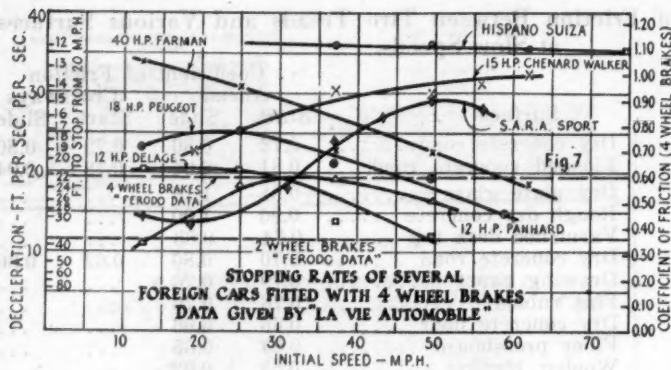
Two stationary pens, U and R, draw marginal reference lines which make it convenient to orient the scale in reference to the recording pen line when measuring the graphical record with a template. Calibration is carried out by simply tilting the instrument and carefully noting the position of the recording pen which corresponds to each angle of tilt.

Since the deflection of the pendulum is small (0.25 in.) in comparison with the length (10 in.), the sine of the angle of tilt is, to all intents and purposes, the force applied to the weight in pounds per pound, or if multiplied by 1000, the pounds per 1000 lb. of car weight. Multiplying the sine of the angle of tilt by the acceleration of gravity, 32 ft. per second per second, gives a calibration in feet per second per second.

Turning now to consideration of the theory on which

Fig. 5—Diagrams which appear to indicate that considerable variations in tire inflation pressure have little if any bearing upon effectiveness of brakes





the decelerometer is based, the following abstract of brief articles on the subject prepared by members of the Bureau of Standards staff should prove instructive to readers not versed already in this matter:

Application of the brakes of a moving car results in a reduction of speed which is obviously the result of a force opposite to the direction of motion. The rate at which the car slows down is directly proportional to the retarding force. If the car is moving at a speed of 20 m.p.h. when brakes are applied and the rate of deceleration is 10 m.p.h. in every second the car will come to a stop in 2 sec. If deceleration is at the rate of 5 m.p.h. per second the car will stop in 4 sec.

The retarding force in the first instance is twice that in the second. The average speed during the stop in the two cases mentioned is 10 m.p.h. The rate of slowing down is directly proportional and the distance required for a stop from a given speed is inversely proportional to the magnitude of the retarding force.

Since the retarding force required to slow down a car weighing 4000 lb. at a given rate is twice that required to slow down at the same rate a car weighing 2000 lb., it is obvious that to stop a 4000-lb. car in 30 ft. from 20 m.p.h. requires twice the force necessary to stop a 2000-lb. car in the same distance from the same initial speed. The retarding force per pound or per 1000 lb. of car weight is, however, the same with both the heavy and the light car, and results in identical stopping distances and rates of speed reduction.

Consequently the effectiveness of automobile brakes can

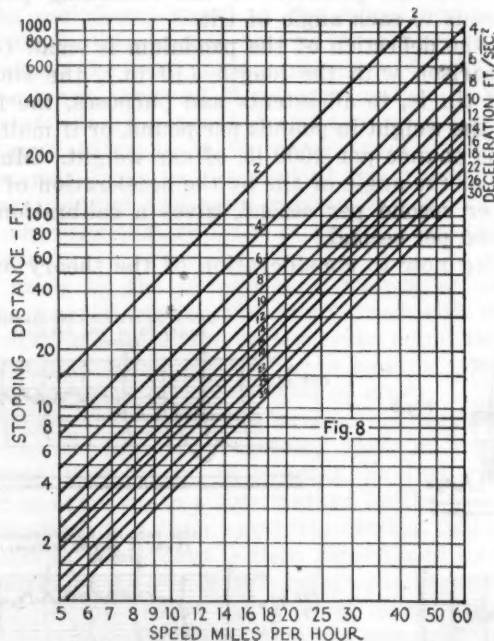


Fig. 8—Deceleration rate and stopping distances from various initial speeds

be determined directly by measuring the braking force per unit of car weight, i.e., per pound, per 1000 lb. or per ton of car weight. The brake decelerometer designed at the Bureau of Standards is constructed in such a manner as to measure the braking force per unit of car weight.

The spring mounted vertically in the base of the instrument is so placed that it deflects in the line of motion of the car. When a braking force is applied to the car a portion of this force is transmitted by the spring from the base of the instrument to the bob above it. This force is the same fraction of the total braking force as the mass of the suspended bob is of the total mass of the car. The force on the bob unit of its weight is the same as the force on the car per unit of its weight. The spring is deflected an amount proportional to the force transmitted through it.

Relations between the distance required to stop, S , in feet, the initial car speed, V , in m.p.h., and (1) the rate of slowing down in feet per second, a , (2) the rate of slowing in miles per hour per second, A , (3) the retarding force in pounds per pound, f_1 , (4) the retarding force in pounds

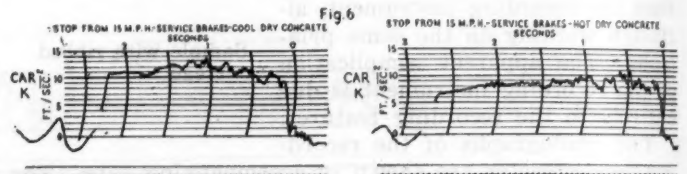


Fig. 6—Effect of temperature on rate of deceleration. Brakes are considerably less effective when brakes are hot

per 1000 lb. of car weight, f_2 , and (5) the retarding force in pounds per ton of car weight, f_3 , are given in the following equations:

$$\begin{aligned} (1) \quad S &= 1.08 \frac{V^2}{a} \\ (2) \quad S &= 0.735 \frac{V^2}{A} \\ (3) \quad S &= 0.0336 \frac{V^2}{f_1} \\ (4) \quad S &= 33.6 \frac{V^2}{f_2} \\ (5) \quad S &= 67.20 \frac{V^2}{f_3} \end{aligned}$$

A plot of equation (1) is given in Fig. 8. Similar plots can be made to show graphically the other four relations.

If either the rate of retardation or the retarding force per unit of car weight is known, the distance within which a stop can be made if the initial speed were 20 m.p.h. can be found by substituting 20 for V in equations (1) to (5).

AN analysis of the causes of power plant stoppages during flight has been made by the (British) Aeronautical Research Committee. Data was obtained from various squadrons of the Royal Air Force. Over a period of six months the number of reported engine stoppages was 273, or one for every 58 hours of flying. The committee believes, however, that owing to the voluntary nature of the return and lack of technical knowledge on the part of some of the officers making them, the record is incomplete. Faults in the fuel system accounted for more than 25 per cent of the stoppages, faults in the magneto, spark plugs or other parts of the ignition system were responsible for an equal proportion, while engine breakages were about 20 per cent.

Parts and Truck Makers Discuss Their Common Problems

Market analysis, bus transportation possibilities and the demands of fleet users are considered at annual meeting of Motor Truck Industries, Inc.

PROBLEMS of the specialized commercial vehicle manufacturer and of the men who supply him with parts were considered at the annual meeting of Motor Truck Industries, Inc., held at Detroit last week. Truck builders were somewhat conspicuous by their absence but several of the largest parts manufacturers were represented by executives or officials.

Martin L. Pulcher of the Federal Motor Truck Co., president of the organization, sketched briefly the present situation in the truck industry, giving especial attention to that branch which uses specialized units. He advocated an attempt to build up a substantial export trade which, he said, could be done through the home office with little expense. His experience in sending representatives abroad had been expensive but fruitless. Foreign dealers are men of a high type and they will stick to any company which gives them good products.

In a brief consideration of the relations between the truck and parts manufacturers, Pulcher criticised the policy of selling at retail in the parts stations established by makers of prominent units. He cited the case of one truck company making its own parts which sold \$7,000 worth in a single city while replacements for assembled trucks were bought largely at parts stations.

This is one of the big questions to be faced, he asserted. He advised parts makers to turn their attention to some product they could sell directly to vehicle users as a substitute for the business he felt truck producers should have in the parts field.

THIS was a subject on which most of the parts men evidently did not agree with Pulcher but there was no discussion of it unless it was at an executive session held later in the day. No report was made of the proceedings at this meeting behind closed doors beyond announcement of the election of officers. Pulcher was made president for another year.

Sales analysis methods were discussed by A. R. Livingston of R. L. Pouk Co. He estimated that truck production this year would be 375,000 and predicted a production of 422,000 next year. He explained that the total value of all agricultural products in 1922 was \$8,500,000,000 which would give a crop value of \$22,700 for each of the 375,000 trucks produced in 1923. The crop value for 1923 has been estimated at \$9,600,000,000 and on the same basis Livingston estimated that it should be possible to sell 422,000 trucks next year.

Livingston then gave an analysis of the truck situation in Detroit as fairly typical. He said that 168 makes of trucks were represented among the 16,250 in use in that city. Fifty-two of these companies have only one vehicle each on the streets; twenty-three have two; eleven have

three each and ten have four each. There are 10,900 light vehicles in use and Fords account for 9,000 of them.

The 5,350 heavy duty vehicles are owned by 3,150 concerns. The biggest buyers of heavy duty trucks are, in order: Warehousemen and truckers; contractors; fruit and provision merchants; coal dealers; manufacturers of soft drinks; lumber dealers; garages; makers and dealers in building supplies; automobile parts makers; automobile manufacturers; manufacturers of steel; manufacturers of ice cream; bakers and iron makers. These are the only classifications operating more than ten trucks.

LIVINGSTON proposed as the next step in market analysis a compilation of every concern in every line of trade in which trucks are used. This would make it possible to list present owners, Class A prospects and Class B prospects. He would place in Class A all those concerns with a commercial rating of \$25,000 or more. His analysis of the Detroit situation for the two classifications using the largest number of trucks showed:

Business	Owners	Prospects
Warehousing and trucking	689	1023
Contractors	117	2470

His survey of the prospect list would give information which would show the size of the dealer, the amount of his investment, how big an establishment he has, etc. This would give direction to advertising and indicate the channels it should take. It also would direct the activities of salesmen, showing the most profitable fields and the names of enough prospects to cover an indefinite period. Campaigns in certain lines of trade should be made at the busiest seasons in those lines.

Difficulties in the way of salesmen were pointed out by Livingston. He asserted that correct methods of approach on the first call accounted for from 60 per cent to 70 per cent of the sale. Sales are rarely made on the first call, however, and the high powered salesman who visits one prospect after another only to get no names on dotted lines are exceedingly prone to become utterly discouraged.

APPROACHES usually are limited by the heart breaking character of the work and he believed it might be advisable to train men who would work on a salary and commission basis, to make the first calls and leave the more temperamental salesmen to mop up on subsequent calls. The men who make the approaches should gather information of various calls to supplement the data already on the prospect cards. This would include present methods of transportation, the kind of equipment used, opinion of present equipment, degree of satisfaction with service, capacities needed, etc.

Pulcher asserted that it might be possible for members of the association to get data on which to base sales analyses in various cities if they would get together and share the expense. He added that salesmen do get discouraged even if they are on a salary but that volume comes from knowing where prospects are. Sometimes salesmen call for two years before they make a sale and the expense of this work exceeds the profits on the transaction. The trouble is, he said, that most truck makers are firing with shot guns instead of rifles. They should be better organized to sell their wares.

A. E. Parson, general manager of the Brown, Lipe Gear Co., said that if a strong association was to be built it would be necessary to give members the information they are interested in and that interest in the association must be strengthened.

M. H. NEWTON, of the editorial staff of *Bus Transportation*, spoke on bus development and the possibilities in this field. What the public wants will determine the future course of bus transportation, he said, but the public doesn't know at this time exactly what it does want. Its ultimate decisions usually differ from first impressions and the creativeness of producers will guide public demand in large measure.

The kind of service and the kind of equipment are the two major problems. Operators are selling the public on the bus and they are the real salesmen for bus makers and they are creating an immense market. They will blaze a trail for all automotive products, they will win support for reasonable highway and regulatory legislation, they will develop communities, they will build up maintenance, they will attract capital and they will exert a marked influence on the labor supply.

He predicted that bus transport would be a \$1,000,000,-000 industry in the near future and that 250,000 buses would be in use in the next five years. While much of the equipment will be of a specialized nature, there will be a big field for adapted trucks for some time to come. There are 50,000 buses of all kinds in use at present, he said, including 12,000 school buses.

PERMANENT success in the bus field will require highly specialized vehicles and the automotive industry is the one which should supply them. There is as yet no definite measure of the possibilities. That city operation will serve two-thirds of the population of the country. Inasmuch as 95 per cent of the population lives within ten miles of a Federal aid highway it is only logical for them to seek automotive transportation. The inter-city field has grown more rapidly than the city field, the equipment for which has been more nearly standardized.

Manufacturers of equipment must organize themselves to produce on a large scale if they are to meet the demand for bus transportation, Newton declared. The city market is more accessible and more economical. The same is true of service. In dealing with the larger operators there is a better chance for cash business because new companies have no old vehicles to trade. Traction companies are looking for equipment with which to feed and supplement their rail service and the size of the fare has no great bearing on their operations at present.

Newton then gave statistics to show the proportions already attained by bus transport and outlined the regulatory legislation adopted by various states to cover motor vehicle common carriers. He said that many applications for franchises had been refused because it was held that the equipment which it was proposed to use was unsuitable for the needs of the territory covered.

In reply to a question, Newton said the dealer had only a limited capacity for selling buses but that up to this

time he had done most of the selling and would be absolutely essential for a long time to come.

David Beecroft, general manager of *Motor Transport*, said he brought to the manufacturers a message from the users of their product and he urged that greater attention be given the viewpoint of these truck operators. Not all the sales in future will be made to new prospects and serious consideration should be given the replacement market.

Fleet owners have had a hard job, up to this time, he said, trying to show a profit on their vehicles. One operator showed a profit of \$40 in a year on a certain make of truck while another make of vehicle in the same fleet returned a profit of \$1,800 the same year because it was out of service less frequently and for shorter periods.

Unless a truck earns something for its owner it is not a profitable investment. Users are studying costs and operating methods. They have learned what different makes of trucks are doing and what to expect from them.

"New times demand new methods and new men." There are many fleet owners today who are ready to pay \$15,000 a year to efficient superintendents of transportation because they believe an efficient man will save them \$100,000 a year. New methods are evolved, pioneered and developed by new men.

The trinity of good business, Beecroft said, is: A legitimate field; capital and capable men in all departments.

MANUFACTURERS and dealers always can get an audience with the fleet owner if they are able to talk intelligently of the users problems. Many operators have kept horses because they haven't been able to buy the kind of equipment they want. Trucks can be sold more easily if the wants and needs of operators are studied. Motor transport is no longer the step-child of business but a full fledged member of the family and big executives are studying it as never before.

Beecroft gave figures to show that 88 per cent of the operators of fleets exceeding ten trucks have their own service stations while 40 per cent of the operators of from one to three trucks do their own servicing.

He said he believed manufacturers thought too much of specifications while transportation is what buyers want. They take all factors into consideration in figuring out economies. They buy those vehicles which they believe will give the most continuous service and thus make money for them just as manufacturers put machines in their factories to make money for them.

They also are inquiring rigidly into the relative earnings of the parts and accessories they use. Their whole purpose is to keep down labor and service costs. They are considering the reliability of manufacturers as well as the reliability of their products. They want to know the makers financial status, the personnel of his organization and how broad a vision he has of the field he serves.

Those manufacturers who can best talk the user's language and understand his problems most clearly are the ones who will win the largest measure of success.

THE British Air Ministry has prohibited the use of high tensile steel fork ends for airplane stay wires, as they have been found unsafe. They are to be replaced by fork ends of low carbon steel, and no certificate of airworthiness is to be issued until this replacement has been made on a plane. It is stated that the high tensile steel turnbuckles in common use are all of wartime manufacture and are liable to exhibit fine hair cracks and flaws in the steel and season cracking in the barrels. In the case of seaplanes turnbuckles with delta metal barrels are recommended, rather than mild steel barrels, to prevent rust.

Explains Theory Governing Carbureter with Intake Throttle

Mixture required to give minimum consumption varies only with inlet pressure due to corresponding dilution of charge with burned products. Design of Stewart-Warner instrument is based on this fact, not on proportioning fuel to air drawn through.

By Percival S. Tice

Engineer directing Carbureter Division, Stewart-Warner Speedometer Corp.

THERE are two desirable limiting sets of engine operating conditions with respect to mixture proportions: (1) that in which the greatest possible percentage of the fuel in the charge is burned usefully; and (2) that in which the greatest possible percentage of the oxygen in the charge enters into the combustion. In the first case the specific consumption of fuel is least; and in the second the output of the engine is greatest. Experimental evidence shows that the greatest output, in respect to weight of charge, is secured under all conditions of load and speed with a substantially constant mixture proportion.

From detailed experimental examinations of many engines, it appears that the optimum mixture to produce minimum specific consumption fundamentally varies in its proportions with the intake pressure, and with nothing else. But since it is amply proved that the pressure, per se, is not a prime factor in the case, it is concluded that the variation in mixture proportion is imposed by a cause other than the change in pressure, but varying with it; and analysis indicates that this cause is primarily the dilution of the charge with combustion products.

In Fig. 1 are plotted two curves, one of optimum mixture proportion ($R = A/F$) on a relative basis, the open throttle mixture being taken as unity, and one of its reciprocal as representing relative fuel in the charge, both being plotted against the absolute intake pressure. The curve marked R in this plotting is a composite of the results from work with several typical engines.

Weight of Air Pumped

In the operation of an engine under throttle control the weight of air it pumps is expressed by an equation of the form: $A = (aN + b) (P - c) d/T$ (1) in which a , b , c and d are constants, the first two, a and b , involving the dimensions of the engine; N is the revolution rate of the crank; P is the absolute pressure in the intake; and T is the absolute temperature of the charge in the intake. The weights of air pumped by an engine operating at a constant speed under throttle, as found by direct measurement, are shown in Fig. 2 by the curve x , plotted again the absolute intake pressure in mm. of mercury. Computation from the data of the test places the weight percentage dilution of fresh charge with com-

bustion products at 5.3 per cent at open throttle in this particular case, which is typical. That is to say, the total weight of contents of a cylinder is relatively represented by a point Y in Fig. 2, the value of $Y - X$ being 0.053 times that of $X - Z$. Points on a straight line drawn from point Y through the origin of axes may be taken as representing the total weight of cylinder contents at any intake pressure, since the weight will be directly as the pressure in the absence of temperature changes at end of intake stroke, and these latter are relatively small over the throttling range. On this basis, the dilution, in terms of weight of air pumped, is the ratio $Y - X/X$, and is as shown by the curve marked "relative dilution" in Fig. 2.

Optimum Fuel in Relation to Diluting

If, now, values of the optimum relative fuel in the charge from Fig. 1 are plotted against the corresponding relative dilutions from Fig. 2, the curve of Fig. 3 results as an expression of the general relationship between optimum relative fuel in the mixture and the dilution of fresh charge with combustion products.

In any carbureter the fundamental expression for the amount of fuel discharged from a nozzle located in the air stream is $F \propto ca\sqrt{h}$ (2) in which c is the coefficient of discharge for the nozzle, a is the nozzle area, and h is the head or force causing the discharge, expressed as a height of fuel column. It is also fundamental that $h \propto V^2 D/d$ (3) in which V is the velocity of the air stream at the nozzle outlet, D is the density of the air in that part of the stream, and d is the density of the fuel. Substituting for h in (1),

$F \propto ca V\sqrt{D/d}$, or simply $ca V\sqrt{D}$ (4) since d is a fixed quantity in any particular fuel.

The air passing the nozzle in unit time is

$A \propto C a_t V D$ (5) in which C is the coefficient of discharge for the throat or passage in which the nozzle is located, and a_t is the area of that passage. Thus the mixture ratio is expressed

$$R = \frac{A}{F} \propto \frac{C a_t}{ca} \sqrt{D} \dots \dots \dots (6)$$

From (6) it is evident that a simple carbureter, having fixed areas of air and fuel passages, will supply richer mixtures as the air is increased, by virtue of the reduction in throat air density that follows the increase in flow.¹ This is the only cause of inherent enrichment in a simple carbureter, since it is a mere matter of design of fuel passage to cause the other controlling factor, the ratio C/c , to remain so nearly constant as to have a negligible effect.

1. In the conventional plain tube carbureter as ordinarily fitted to the average automotive engine, the metering head h will vary from about 2 in. to perhaps 60 in. of fuel, over the load and speed range, these values representing pressure drops below atmospheric in the throat. Taking the average atmospheric pressure at 745 mm. of mercury, the values of throat pressure, and therefore density, corresponding to these head values bear the relationship 661/742 (1 in. of fuel of .750 sp. gr. = 1.4 mm. of mercury). The effect in this case is to change R at the maximum air flow to $\sqrt{661/742} = .944$ of its value at the minimum air flow.

Since it is only with a so-called "thin plate orifice," one having an effective length to diameter ratio not to exceed .3, that the ratio C/c remains constant (the effect of greater relative lengths being to increase c as the head is increased), there is, in practically all carbureters, a natural enrichment with increase in air flow in excess of that resulting from the reduction of air density in the throat. Most of the effort expended in carbureter design has been directed at a correction of or compensation for the enrichment upon increased flow resulting from these causes.

Reference to the curves of Fig. 1 shows that, as distinguished from the enrichment that naturally occurs, it is actually a considerable reduction in relative fuel in the mixture that is required as the intake pressure is increased. But note carefully that these optimum changes in mixture proportion are in no wise functional with the amount of air passing the carbureter, except as the amount of air alters the intake pressure and therefore the dilution. The same weight of air can be pumped by an engine at many different speeds, at as many different intake pressures and dilutions as speeds, each requiring a different mixture proportion for optimum performance.

From this an unavoidable conclusion is that optimum mixture proportions cannot be had in a carbureter in which the metering control is exercised by the amount of air drawn through it. It further appears that change in amount of air without change in intake pressure should cause no change in mixture proportion.

What really is required of a carbureter to supply mixtures of optimum proportions, with respect to specific fuel consumption, is that the proportion remain constant at any intake pressure, regardless of the amount of charge delivered, and that the proportions vary suitably with change of intake pressure. Intake pressure is named in

this connection because the dilutions upon which the mixture proportions are really based are functional with it, and something can be accomplished through applying the intake pressure changes to control the relative fuel, while such application of the dilution changes is not feasible.

If the simple plain tube carbureter is rearranged so that the throttling is done in the air intake instead of in the mixture outlet, it is clear that the density of the air in the carbureter passage becomes smaller as the air flow is reduced by throttling, and that manipulation of the throttle causes the air passage of the carbureter to be subjected to the same general range of pressures as is the intake manifold from which the engine draws its charges. Such an arrangement becomes completely operable as a carbureter by sealing the float chamber from the atmosphere and equalizing its pressure with that at the entrance to the throat or constriction in which the fuel nozzle outlet stands. Its functioning is controlled by the same laws as govern the simple outlet throttled carbureter with atmospheric float chamber vent, as set down in the foregoing expressions for F and R , except in one important particular which will be described later.

In Fig. 4 is a replotting of the optimum relative R values in Fig. 1, together with a curve of theoretical relative R resulting from the relocation of the throttle and float chamber vent, as described in the preceding paragraph. It will be seen that there is fair agreement between them, both with respect to range and general slope, without the employment of any auxiliary compensating devices. But of equal importance in the mixture, proportional control in this arrangement of parts, is the constant R value at a given intake density or pressure that is essential to the delivery of optimum mixture proportions. Both the change in R with change in D , and the constant R with

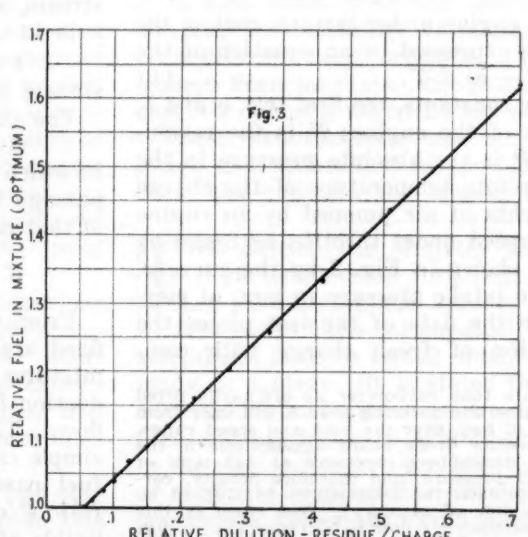
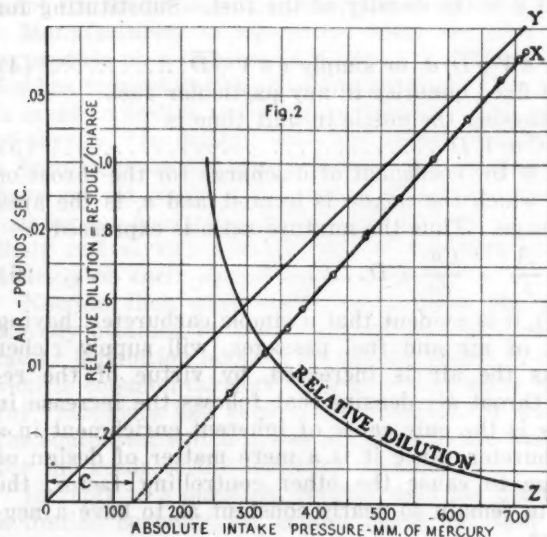
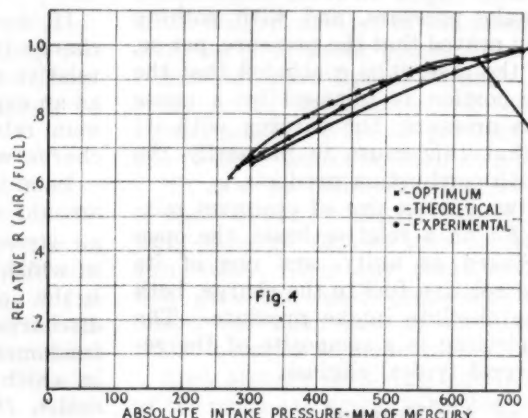
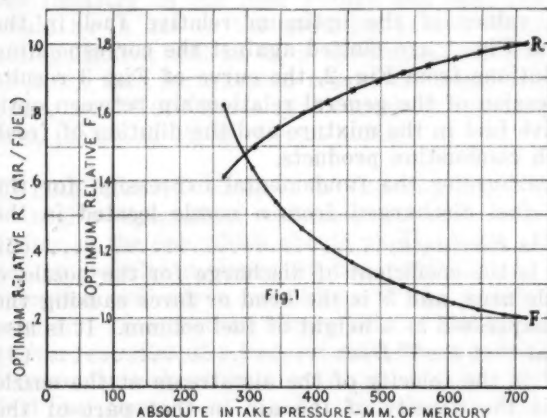


Fig. 1—Curves showing how mixture proportion must vary under throttle to secure least specific fuel consumption in the average car engine. Fig. 2—Curves used in graphic determination of charge dilution with combustion products. Experimental air curve produced does not pass through the original because of residual gas left in cylinders. Quantity c in this figure defines the value of the constant c in equation (1). Fig. 3—General relationship between charge dilution and mixture enrichment to secure greatest economy of operation. Fig. 4—A comparison of optimum mixture proportion variation under throttle with the R variations theoretically and experimentally obtained in Stewart-Warner carburetor

Automotive Industries
November 29, 1923

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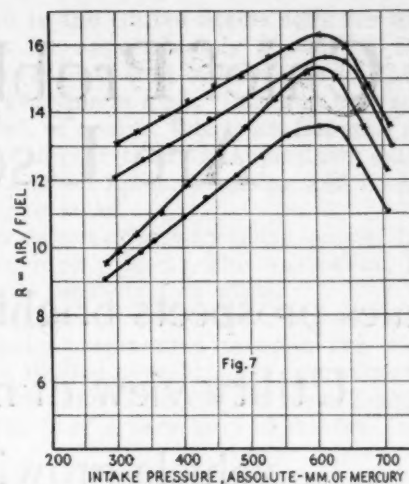
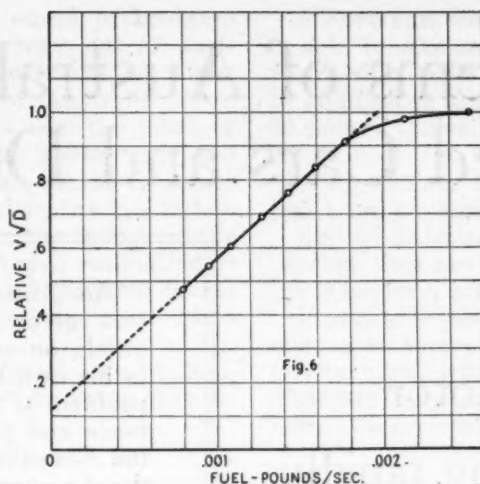
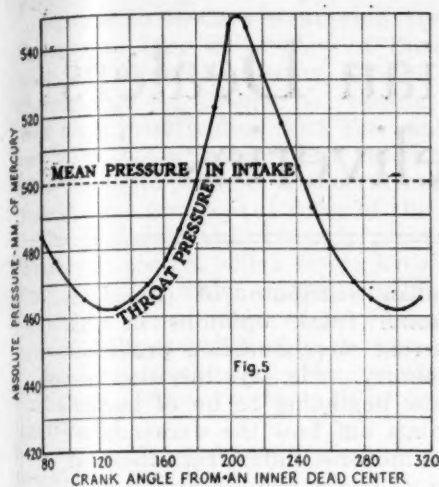


Fig. 5—Typical cycle of pressure variation in the intake of a four-cylinder engine. Fig. 6—Experimental relationship between rate of fuel discharge in Stewart-Warner carbureter and the quantity to which it is theoretically proportioned. Fig. 7—Typical mixture proportion curves developed in Stewart-Warner carbureters to best suit variables in the engines to which they are applied

constant D are inherent in the design, and are subject to only minor and easily controlled deviations.

There is also shown dotted in Fig. 4 a curve of relative R as found from direct measurements of air and fuel, the engine being operated over its load range at a constant speed. These curves are in close agreement at intake pressures below about 600 mm., and as the pressure is increased beyond this value the curve of experimental relative R first flattens and then slopes downward, showing a rapid rate of enrichment of the mixture to open throttle. This is the point of exception noted earlier in the performance of this type of carbureter, and results from the combination of pulsating flow in the carbureter air passage and the equalization of the float chamber pressure with that in this passage.

In the operation of an engine the intake valve opens in the immediate neighborhood of inner dead center; and since the clearance spaces of the cylinders are always filled at this time with gas at or somewhat above atmospheric pressure (the exhaust valve having just closed), there will under all conditions of operation, be an outflow from cylinder to intake at this time. This gives rise to pressure variations in the intake which augment those pressure pulsations naturally resulting from the intermittent inspiration of charge by the cylinders.

Effect of Increased Throttle Opening

The general order of variation of the pressure pulsations in the intake of a four-cylinder engine is shown in Fig. 5, as is also the corresponding mean intake pressure, as shown by manometer. The effect of increased throttle opening in such a case is to raise the mean pressure and with it the pulsating pressure values without changing the amplitude of the pulsations very greatly. This being the case, it appears that mean pressures will be reached, as the throttle opening is continued, at which the maximum values of the pulsating pressure will equal and then exceed the pressure of the atmosphere. It is also clear that, so long as the peaks of intake pressure lie below atmospheric, there will be unidirectional flow of a varying rate in the carbureter air passage; and that when the peak pressures exceed the atmospheric pressure, there will be reversals of flow direction induced by pressure pulsations.

In the conventional outlet throttled carbureter the effects of pulsating flow upon the metering of fuel are relatively small because the damping action of the throttle reduces the amplitude of the pulsations experienced in the

carbureter passage, as compared with those in the intake; and the effect is minimized, even at fully opened throttle, by the constant float chamber pressure.

It is a property of the Stewart-Warner carbureter structure that the metering head is maintained at positive values throughout the cycle of intake pressures, and that, owing to the throttle location and the float chamber pressure equalizing passage, the effective head for a given air flow is augmented at an increasing rate as the pulsation peaks rise farther above atmospheric pressure. It will be noted in Fig. 4 that the experimental curve agrees quite well with the theoretical up to a mean intake pressure of about 650 mm. Below this mean pressure the pulsation peaks are below atmospheric pressure, in the average engine; at about this pressure they come into equality with the atmosphere; and above this mean pressure the peak pressures increasingly exceed the atmospheric pressure.

The direct effect of metering control upon quantity of fuel discharged by the nozzle is shown in Fig. 6, which is a plotting of the directly measured quantities of fuel involved in the operation of this type of carbureter on an engine against the quantity " $\text{relative } V\sqrt{D}$ " computed from the air weights, pressures and temperatures of the test. The linear relation indicated by equation (4) holds up to that intake pressure at which the flow ceases to be unidirectional, after which there are departures as indicated by the observed values as compared with the dotted extension of the straight line portion of the curve, as shown in the chart.

This characteristic shape of metering curve is of advantage in service, in that it permits of operation over the most used and greater part of the load range on mixture proportions giving a very close approach to the highest possible economy, without adjustment and without dependence upon working parts, and also causes the development of maximum power at open throttle, which maximum of power cannot be obtained with the leaner maximum economy mixtures.

In the practical fitting of the carbureter use is made of variations in the aspirating power of the air jet or spraying device incorporated in the nozzle, to alter the slope of the R curve to suit the peculiarities of any given engine design. Typical examples of modification of the metering curve by this means, in combination with fuel nozzle and throat area changes, are shown in Fig. 7, these departures having been made in fittings to engines to suit individualities of compression ratio, turbulence, scavenging and spark plug location.

Chief Problems of Australian Dealers Are Used Cars and Deliveries

Sales prospects bright.

Utility view of motor
vehicle growing rapidly.

AUSTRALIAN distributors and dealers have had considerable difficulty in the past in getting prompt deliveries from American car manufacturers, despite the fact that Australian seasons are just the opposite of ours. Inability to get shipments when needed has been one of the greatest problems confronting motor vehicle merchants in Australia, according to R. J. Hancock, director of Dort sales in Australia, who visited the United States recently on a tour around the world.

Sales prospects in general are very bright, however, Hancock said, when questioned about the Australian market. "There are 100,000 cars in use in Australia at present," he pointed out, "while the population is about 5,500,000. It is quite obvious that the number of cars per person is low. Buyers right now are more confident in making a purchase than they have been for some time."

Hancock had a number of interesting remarks to make about various phases of the automotive situation in Australia. In addition to the points already mentioned he commented particularly on the difference in demands made by Australian and American motorists, the growing importance of the used car problem, and the success of Australian dealers in pulling through the 1921 business depression. He said:

Perhaps one of the greatest difficulties that Australian distributors and dealers have to contend with is that of deliveries from the United States. Our seasons are just the opposite from yours. In other words, our winter is your summer. This really should mean that your slack period should enable the manufacturer to get ample deliveries down to our territory in the right season, but it certainly seems that during the past eight years there scarcely has been a time in which these conditions have been properly regulated.

Difficulties in Getting Shipments

When sales were plentiful, deliveries were exceedingly indifferent, but, of course, during our period of depression we had a far greater supply of cars sent to us than there was any possibility of selling. Each year we are promised better conditions, but even up to the time I left Australia there was scarcely a distributor who did not have quite a large number of cars sold to arrive, and in many instances buyers have to wait two and three months for deliveries.

A more complete understanding between exporter and

An Australian distributor of American cars gives some frank opinions in this article on current merchandising problems in his own country. He says the used car problem is just beginning to be of importance and points out how the demands of the Australian motorist differ from those of the American.

importer seems to me to be the only possible remedy. Neither one can be expected to take the whole responsibility of this business. The American factory must maintain a sufficient stock of material in anticipation of trade coming from the export market, and the Australian distributor must place with the factory at least an approximate estimate of his requirements.

Unfortunately there are only a few organizations which seem to have seen the advisability of fostering and encouraging the export trade, which should prove an excellent standby for American manufacturers in case of local depression or overproduction.

Motor Vehicles Help Commerce

Sales prospects are exceedingly bright. There are huge tracts of Australia over which it is possible to travel at any reasonable speed only by automobiles. The railroad service is mainly confined to the coastal area. It does not penetrate more than a few hundred miles inland.

The automobile has made it possible for merchants to go much farther into the interior and carry on their enterprises at a much greater profit and under more comfortable circumstances than was heretofore possible. Quick transportation of goods, mails, etc., by automobile has made life in the back areas much more comfortable and endurable for commercial purposes. There is still a large field for both light and heavy service vehicles.

There is quite a difference between the demands of the American and the Australian motorist. While in America the automobile has become a utility vehicle, in Australia it is still thought of as more or less of a novelty, although the idea of utility is gaining ground.

People over there buy on pride of appearance, pride of ownership and comfort more than in America.

For instance, we build all of our own bodies and put them on American chassis. The Australian traveler likes to have more room in the front seat, and he likes to have the seats in a more reclining position. He buys more accessories, and he likes a better grade of upholstery than is found in American cars.

The used car problem in Australia is just now assuming rather serious proportions. Articles appearing in the various automobile journals dealing with this subject are very eagerly read by those engaged in this class of trade. The most successful concerns dealing in the used car business are those that have adopted the reconditioned and guaranteed used car method. In fact, used cars cannot satisfactorily be sold any other way.

Australian dealers weathered the storm of business depression very well. Few of them went out of business. I think the reason for this was the fact that throughout the commercial section of Australia there was an understanding with the banks that the stronger concerns would more or less assist the weaker ones, the idea being to prevent a general crash, which no doubt would have occurred if some of the concerns had failed.

The principal object was to prevent the failure of the weaker concerns, which would have forced realization or bargain sales, which would have leveled the stock prices of the stronger concerns which were very much overloaded with material at that time.

Australian dealers are necessarily handicapped in selling cars because of the high price of motoring in Australia.

A Ford car, which in the United States sells for \$298, is sold in Australia for approximately \$1,000. A Dort Four, which sells for \$885, is sold in Australia at \$2,000. In addition to this, gasoline is high. Gasoline now costs 60 cents a gallon, but, of course, this is an Imperial gallon, which is a fifth larger than the American gallon. Seventy-five per cent of all the automobiles sold in Australia are of American make.

English-built cars do not offer very much competition, because they are too high priced. The Australian, like the American, buys a great deal on style.

Practically every make of automobile of any consequence is energetically represented through the whole territory, and with a limited population of approximately 5,500,000 in Australia and 1,250,000 in New Zealand, naturally competition is of a very keen character.

Mercury Industrial Tractor Has Internal Gear Drive

HERETOFORE the industrial trucks and tractors built by the Mercury Mfg. Co. have been equipped with worm drive, but the latest model to be placed on the market, the Type H, has a balanced internal gear drive. Tests are said to have shown a very material reduction in the watt-hour consumption per ton-mile, in other words, an increase in efficiency.

The motor, motor hanger, rear axle housing, rear wheels, rear springs and all driving gears form a single unit referred to as the power plant, which can be quickly removed from the frame. The motor connects to the driving pinion through a self-aligning spring coupler. This driving pinion, of the bevel type, meshes with a bevel gear in the axle housing. From this bevel gear the rear wheels are driven through the axle shafts, spur gears at the ends of these shafts, three idlers inside each rear wheel and the internal gear ring inside the wheel rim. The motor is of the high speed type and is geared to the

drive wheels at a reduction of either 18 to 1 or 24 to 1. The normal drawbar pull is 475 lb. with the 18 to 1 reduction and 600 lb. with the 24 to 1 reduction. The speeds are $7\frac{1}{2}$ and $6\frac{1}{2}$ m.p.h. respectively. The chassis without battery weighs 1850 lb. With battery, which may be either Edison or Exide, the weight ranges from 2750 to 3550 lb. A valuable feature of this tractor is the short turning radius, which is secured by placing the two front wheels comparatively close together on a short axle, on which the forward end of the tractor is supported through an elliptic spring, yoke and king bolt. For very rough travel, where greater stability is necessary, the company makes a front axle of standard length, with knuckle steering.

Brake Drum Standards Proposed

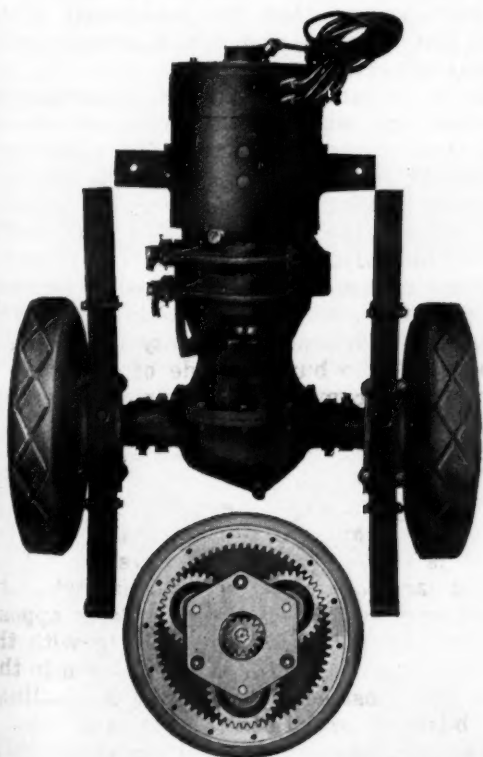
THE Subdivision on Brake Drums has submitted to the Axle and Wheels Division of the Society of Automotive Engineers Standards Committee a final report covering the standardization of brake drums. The recommendation, which is given in the accompanying table, will be acted upon at the next meeting of the division and, if approved, submitted to the Standards Committee for action at the annual meeting of the Society.

Brake Drum Dimensions Proposed as Standard

No.	Outside Diameter	Inside Diameter	Stock Thick- ness	Maximum Height of Wall	Maximum Eccen- tricity
0	8½	8.005-7.995	0.1250	1½	0.020
1	10	9.790-9.770	0.1250	1¾	0.020
2	11	10.710-10.690	0.1650	2½	0.020
3	12	11.666-11.646	0.1875	2¾	0.020
4	13	12.666-12.646	0.1875	2¾	0.020
5	14	13.635-13.615	0.2030	3	0.020
6	15	14.635-14.615	0.2030	3	0.020
7	16	15.605-15.585	0.2180	3½	0.030
8	17	16.541-16.521	0.2500	3½	0.030

All dimensions in inches.

Although the subdivision voted favorably on the report, some comments were submitted which will be considered by the division when final action is taken, the principal criticism being that maximum brake drum widths, rather than definite widths, have been specified. It is apparently felt that the standard would be of more value if a definite width or series of widths were specified for each brake drum diameter. Comments in reference to this point will be appreciated by division members.



Unit powerplant of Mercury electric industrial tractor with balanced internal gear drive

French Device Automatically Takes Up Slack in Braking Systems

*Maintains constant clearance between brake sectors and drum.
Arrangement worked out to obviate difficulty arising when
the brakshaft lever comes nearly into line with the rod.*

A DEVICE for automatically taking up the slack in braking systems is at present being demonstrated in this country by C. S. Albanese of Paris. The chief cause of slack in the braking system is wear of the brake lining, but wear in the joints of the linkage also produces it. When a car is first turned out from the factory the brake linkage is so adjusted that when the brake is fully applied the pedal is within convenient reach, but after the lining has worn down, it may be impossible to apply the brakes properly, either because the shank of the pedal abuts against the end of the slot in the foot-board or because the reach of the driver's leg is not sufficient. Ordinarily adjustment is then made by means of a turnbuckle in the linkage or by some device located

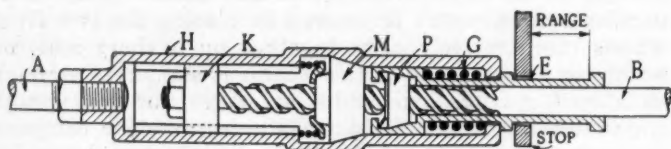


Fig. 1—Sectional view of A. L. M. automatic brake take-up

directly at the brake. The device herewith illustrated makes this adjustment automatically and maintains a constant clearance between the brake sectors and the drum.

A sectional view of the take-up as made for insertion in the brake linkage is shown in Fig. 1. A is the pull rod, which may be connected to the pedal, this rod being screwed into a sleeve H and secured by a lock nut. B is the brake rod, which is provided with a steep-pitch screw thread at its forward end. E is an inner sleeve provided with two collars outside sleeve H and with a head inside that sleeve which contains the conical nut P. A stop plate secured to the chassis frame surrounds sleeve E between the two collars, the left-hand collar resting against it when the brake is released, and the free space between the stop plate and the right-hand collar, limiting the range of motion of the linkage.

Sleeve H is made with a conical seat for nut M. At the end of the threaded rod B there is a slotted headpiece K capable of moving on splines cut on the inside of sleeve H, the object of this headpiece being to hold the threaded rod from rotation. It will be seen that each of the two conical nuts P and M is pressed lightly against its conical seat by a spring, and there is also a coiled spring G behind the head of the inner sleeve E.

A feature of the design, and upon which the action of the take-up depends, is that the angle of the cones of the two nuts P and M, and of their seats, is such that the nuts will wedge in their seats and will thereby be prevented from rotating when pulled against their seats. When off their seats the nuts are free to rotate.

Now, suppose that pull is exerted on rod A in order to apply the brakes, and that, owing to excessive slack-

ness in the system, the right-hand collar of sleeve E comes in contact with the stop plate. If the pull rod is moved still further, spring G will compress, nut P will be freed of its conical seat and abut against the internal flange behind it, after which it will screw farther onto the threaded rod. When the pull on the rod is released, the inner sleeve will return to the left until nut P abuts against its conical seat again and any further motion of this sleeve will result in nut M being freed of its seat. This nut also has a certain free range of motion, and after this has been taken up, if the threaded rod moves still further to the left, this nut abuts against the internal flange behind it and then screws further onto the threaded rod. Nuts P and M and their associated parts act somewhat like a ratchet mechanism; the nuts can screw onto the threaded rod further but cannot unscrew.

Insertion of the take-up described in the operating linkage of the brake has the advantage of simplicity, but it does not prevent change in the angular position of the brakshaft and its lever with wear of the brake lining. The brake linkage is usually so laid out that in applying the brake the lever on the brake shaft describes substantially equal angular motions on both sides of that position in which it is at right angles to the connecting rod, in which latter position the mechanical advantage is greatest. After the brake lining has nearly worn out, it may happen that the brakshaft lever comes nearly in line with the rod, which greatly reduces the mechanical advantage.

In order to obviate this difficulty, an arrangement has been worked out whereby the brake sectors are supported at their pivoted ends and in the middle by fittings embodying the same automatic principle as the take-up for the brake linkage just described. There are two differences between the take-up for the brake sectors and that for the brake linkage, however. The former is made with only a single conical nut, instead of two, and when operating to take up any slack in the system, the threaded rod withdraws from the sleeve instead of enter-

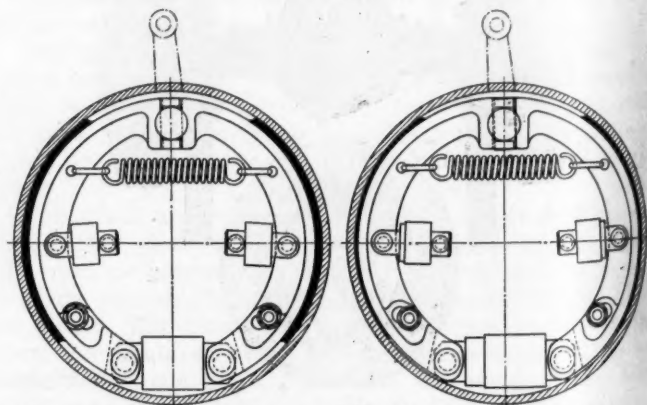


Fig. 2—Application of take-up to brake shoes

ing further into it, this latter effect being secured by reversing the position of the conical nut in the sleeve.

Referring to the illustration of the internal brake, the sectors are supported on the brake carrier by studs which pass through oblong slots in this flange. The "fixed" ends of the sectors pivot on opposite ends of a take-up, one on the sleeve and the other on an extension of the threaded rod. As the lining wears, the conical nut moves on the threaded rod in substantially the same manner as described in connection with the take-up for the brake linkage, and the same clearance is maintained between the brake segments and the drum when the brake is off. Consequently, the brakeshaft lever will

always be in the same angular position when the brake is on, which is the object sought.

The play of the nut between its conical seat and the stop behind it is made equal to the clearance of the brake sectors when newly assembled. When this clearance increases, due to wear of the brake lining, the take-ups act to reduce it again. Owing to the fact that when the brake is released the free ends of the brake sectors are always held against the cam by the return spring, as soon as the take-ups at the middle of the sectors have taken up any excess clearance, the take-up joining the two pivoted ends of the sectors will also act, increasing the distance between the pivoting points.

New Saw Has Steel Blade Which Can Be Sharpened Often

AN important advance in the art of sawing metals is claimed to have been made by the firm of Edward G. Herbert, Ltd., of England. The improvement is ascribed to three things, as follows: First, a saw blade made of high speed steel containing 18 per cent of tungsten and which has a patent set enabling it to be sharpened many times; second, a saw-grinding machine of novel design which forms the correct shape of tooth; third, a sawing machine capable of running at high speed and under conditions which permit of the full benefit to be obtained from the high speed steel blades.

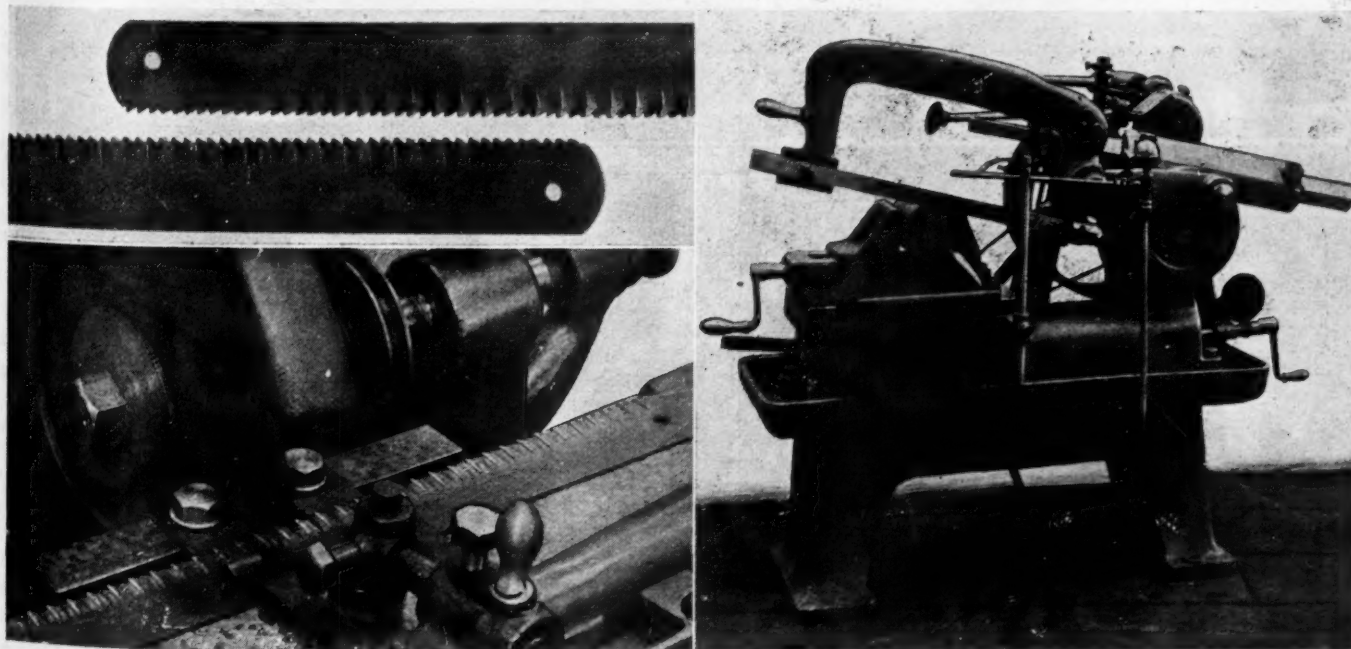
A diagram of cutting times for a 4-in. soft steel bar in a No. 1 Rapidor sawing machine operating at 170 r.p.m. and with a substantial pressure on the saw-blade is exhibited by the manufacturers. The first cut, which was made with a pressure of $5\frac{1}{2}$, was completed in $9\frac{3}{4}$ min., but by the tenth cut the time had been reduced to $7\frac{1}{4}$ min., by increasing the pressure to 10. This comparatively slow start was due to the fact, it is said, that the blade had not been ground beforehand. After the first grinding the pressure was kept at 8. The effect of grinding is shown by the fact that whereas the 105th cut took 10 min., the 106th cut, after sharpening, was made in $5\frac{3}{4}$ min. The 282d cut was made in $4\frac{3}{4}$ min., indicating that the

longer the blade is used the quicker it cuts.

It is claimed that the high speed steel blades are particularly suited to sawing the harder steels, which quickly wear out the ordinary blades. The feature of the blade is that the set of the teeth extends below the root of the teeth, and the blade can be sharpened until the original teeth have been entirely worn away.

In the Rapidor sharpening machine the blades are ground with the aid of models with the correct form of teeth. The grinding wheel is stationary, while the blade moves toward the wheel in contact with the models. The teeth are ground on both sides. A diamond rest is supplied and arranged to true the wheel to the correct angle.

Rapidor sawing machines are designed to operate at 170 r.p.m. with a heavy pressure on the blade. The main shaft and crankpin are hardened and ground, and a complete system of mechanical lubrication is fitted, oil being fed from a central reservoir to all parts requiring lubrication. There is an indicator on the saw-holders to show when the blade is strained sufficiently, which tends to prevent breakage of the blades through incorrect tension. To prevent breakage of teeth when a start is made on a sharp corner or square, the machine is fitted with an improved dashpot.



1—Rapidor saw blade with teeth which can be sharpened. 2—Grinding saw blade in Rapidor grinding machine. 3—Rapidor sawing machine

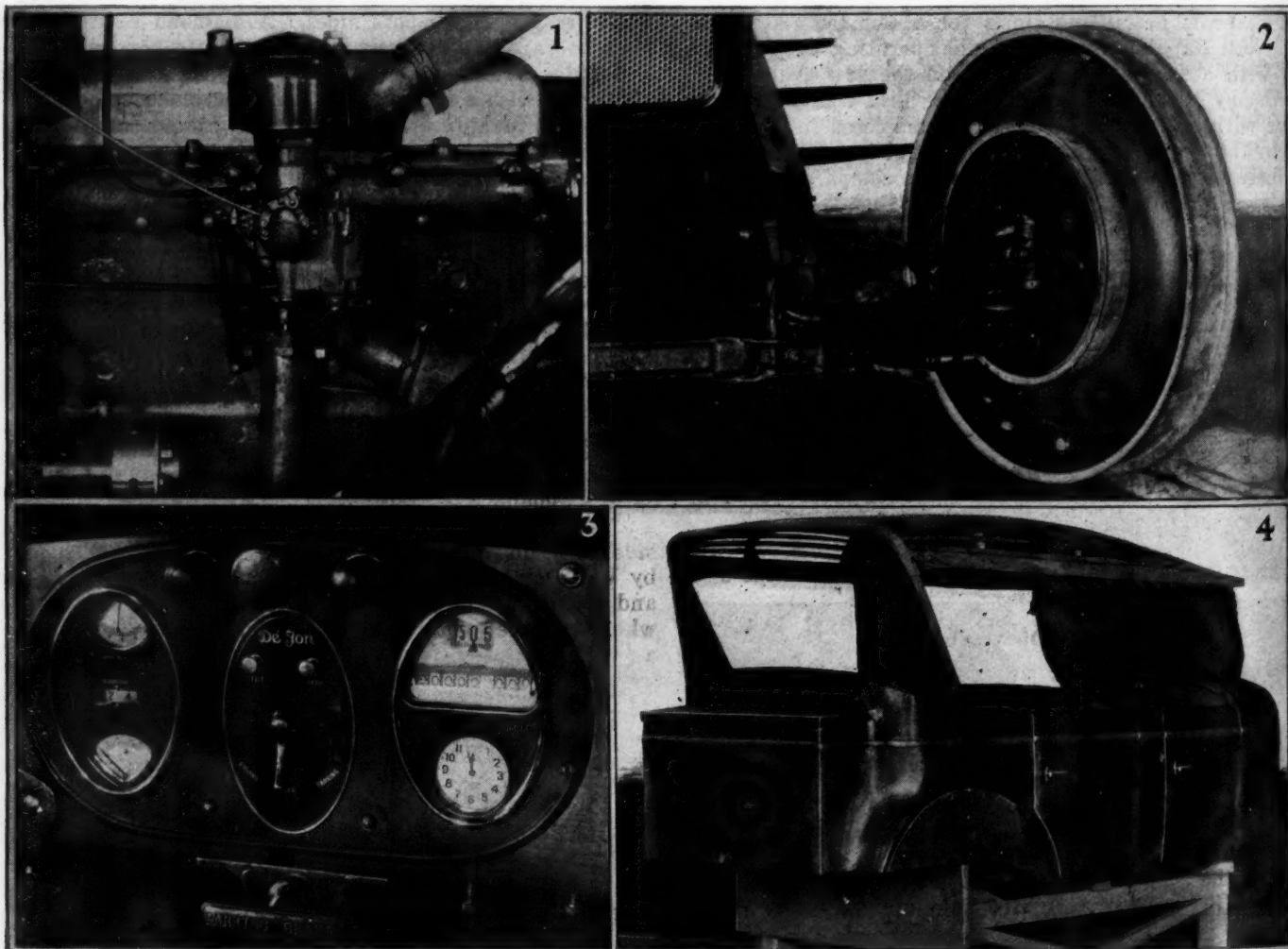
New Elgin Has Automatic Gear Shift and Four-wheel Brakes

Standard equipment includes semi-balloon tires and an air cleaner. Only open model is specially equipped sport car. All body types are mounted on chassis of 118 in. wheelbase. Powerplant is a Falls six-cylinder, valve-in-head engine.

INCORPORATING front-wheel brakes, automatic gear shifting, semi-balloon tires and an air cleaner as standard equipment, the new Elgin car will make its appearance at the New York and Chicago shows. It will be made in one wheelbase length, 118 in., and will be fitted with three types of body—the four-passenger sport model known as the sportsman, a three-passenger coupé and a five-passenger sedan. There will be no standard five-passenger touring car, the only open model being the specially equipped sport car which is sold complete with spare tire, cover and front and rear bumpers. There

is a price difference of only \$250 between the coupé and the sport model and \$350 between the sedan and sport model, and \$350 between the sedan and sport model, the sportsman selling at \$1,895, the coupé at \$2,145 and the sedan at \$2,345.

The engine is a six-cylinder $3\frac{1}{8} \times 4\frac{1}{4}$ in. Falls, said to be designed specially for this car in a number of respects. It is assembled with the clutch and gearset as a unit powerplant with three-point suspension and is a valve-in-head unit with three main bearings, iron pistons, thermo-siphon cooling and pressure lubrication. The



1—United air cleaner mounted on air intake of Stromberg carburetor; 2—Front-wheel brake and Columbia front axle; 3—Instrument panel, showing dustproof arrangement of instruments under oval glasses; 4—Permanent type of top used, which is light and does away with the usual bows

carburetor is a Stromberg, the electrical system a DeJon two-unit and the air cleaner a United.

The clutch is a Borg & Beck, the gearset a three-speed Warner with the Cutler-Hammer mechanical type gearshift. The use of the Cutler-Hammer gearshift has eliminated the gearshift lever, and in order to entirely clear the front compartment of levers, the hand brake is controlled by a pull rod on the dash instead of by the usual vertical lever.

The driving torque is transmitted through two Sneed dry fabric disk joints to a Columbia semi-floating rear axle with a one-piece housing, geared 5.1 to 1 on the sedan and $4 \frac{2}{3}$ to 1 on the coupé and sportsman. Both the wheels and differential are mounted on tapered roller bearings. The drive is transmitted through a triangular torque member which is connected to the ends of the rear axle housing and to a point on the right side of the frame just opposite the gearset. The triangular torque layout is used in connection with the double transverse rear spring, $47 \frac{1}{2}$ in. in length. The front axle is a special Columbia front-wheel brake type.

Brake Operation

The four internal service brakes are operated through a divided shaft which passes below the clutch housing. This shaft is provided with levers which connect with the actuating shafts for the front and rear brakes. Operation of the brake pedals rotates the brake camshaft on the front axle. The camshaft and the cam itself float, the camshaft being supported by a bearing at its inner end in the boss in the front axle, while the outer end carries a sort of rhomboid, or diamond-shaped equalizing block, which floats freely in the slotted end of the camshaft. The shaft passes through an oil packing in the flexible tube attached by a flange to the brake cover plate, retaining the lubricant. Two sides of the equalizing block bear against the walls of the slot and two sides against the case-hardened follower faces expanding the brake shoes. The equalizing block floats freely and is self-centering, so that the pressures on the two brake shoes are equalized.

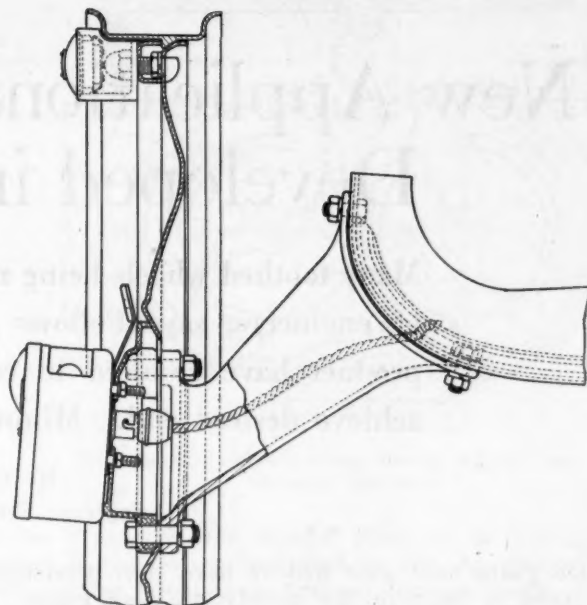
The cam face is said to be shaped in such a way that as the knuckle is turned the effectiveness of the front-wheel brakes decreases, making it practically impossible to lock the wheels while they are turned, as in steering. All of the brakes are adjustable for wear by wedges which control the position of the anchorage. It is possible to take up one or two wedges as desired, thus giving equalized adjustment.

The front axle is of the I-beam, reverse Elliott type. The steering knuckles have ball thrust bearings and tapered roller bearings for the wheels. The tie-rods are of the ball and socket type. Steering is by a Ross cam and lever type gear.

Steel Disk Wheels

The wheels are of the steel disk type, produced by the Wire Wheel Corp., with demountable rims. The tires are 32 by $4 \frac{1}{2}$ -in. cord. The frame is provided with five cross-members. The side rails are channel, $7 \frac{1}{2}$ in. deep and 2 in. in width. The front springs are semi-elliptic $35 \frac{1}{4}$ in. long. Alemite pressure lubrication is used on the chassis.

One of the features of the car will be the extensiveness of the equipment included at the list price. All bodies will be fitted with Hershey combination steering column and ignition switch locks, Stewart speedometer and Elgin clock inclosed under a dust-proof oval glass. The Cole visible gasoline gage, ammeter and oil pressure gage are also inclosed under a dust-proof oval glass. Magnetic headlamp control switch, instrument board,



Arrangement of spare wheel carrier, tail light and license plate bracket

lamp switch and lighting switch are combined in one oval unit on the dash. The equipment includes a motometer, combination stop and tail light, Folberth automatic windshield wiper, rear vision mirror and electric cigar lighter. The coupé and sedan will be provided with exhaust heaters, rain visors, spare tire and front and rear bumpers.

Fundamental Law of Thermo-Dynamics Only Approximate

With each new refinement in our means of observation, says *The Engineer*, we perceive that what we thought simple is in reality complex, that what was once readily grasped and easily capable of being formulated into a simple "law" is really amenable to a control of apparently ever-widening complexity.

The simple gas equation $PV = RT$ represented the truth to Boyle and Charles and their contemporaries, for with the experimental equipment at their disposal it agreed, within the limits of human fallibility, with observed facts.

Subsequently, it was discovered, when the experimental equipment was made more refined, that no gas behaved in accordance with it, some, indeed, showing considerable disagreement. The modification introduced by Van Der Waals eliminated much of the discordance, and although his equation showed relative complexity when compared with the earlier one, it still left us with a tolerable picture of a gas under varying temperature and pressure, even with the matter complicated by the introduction of molecular attractions and volumes.

Renewed investigations with still more refined equipment showed, however, that Van Der Waals' equation contained two "constants," which for any one gas really varied with the temperature. It is on record that over thirty attempts have been made to bring the equation into agreement with observed facts.

According to Dr. J. W. Mellor, one of the best of these attempts was that made by Dieterici. The mathematical expression of the law arrived at by this investigator is still more complicated than Van Der Waals' equation. It contains as a factor a negative power of the base of the natural logarithms, and virtually defies the formation of any precise mental picture of the law.

New Applications of Involute Forms Developed in Recent Years

Many toothed wheels being made which cannot receive approval of engineers, says Fellows executive. Demands for a better product have resulted in creation of innumerable devices to achieve desired end. Minute errors are being studied closely.

By E. W. Miller*

Engineer, Fellows Gear Shaper Co.

FOR years most gear makers have been persistently urged to improve the quality of their gears. In many instances a high degree of accuracy is demanded to eliminate objectionable noise and to increase the life of the gearing. In some cases perfection of tooth shape and exact spacing are important in order that the mechanism may perform its function. There is an ever increasing clamor for quality gears. As a result men have been busy developing machinery to produce the finest possible gear teeth and in producing measuring devices which shall record the result of the machine's effort.

This continual demand for improvement of product resulting in the creation of innumerable devices for the accomplishment of that end has brought about an appreciation of minute error and exact measurement not commonly found in other areas of the mechanical field. Gear engineers as well as the actual makers of gears in the shop have become "fine-haired."

There are certain possibilities at present largely unconsidered which even superficial observation makes plain. I refer to the substitution of cut gears for those now having the teeth cast or punched. In these cases not only will the cut gear be a great improvement with respect to quietness and smoothness of operation, but it can be demonstrated many times that the manufacturer can produce them more cheaply by cutting than otherwise. Expense of assembly and hand work on the teeth may far exceed cutting costs. It is our business first to investigate and then demonstrate if we would fully develop our industry.

*Abstract of paper read before semi-annual meeting of American Gear Manufacturers' Association, Lake Mohonk, N. Y.

Thousands of toothed wheels are being made today which cannot receive our stamp of approval as gear engineers. History is behind those tooth designs. It is usually found that some mechanical genius has worked out a device experimentally. Cut and try methods have resulted in notched wheels which cause the mechanism to work satisfactorily. A market has been developed and the gear teeth are patterned after those in the experimental machine. In many instances a great business has developed from this machine which carries the toothed wheels of uncertain identity. Special machinery is developed for the production of these gears and they are made in great quantities. Analysis makes plain that these primitive gear tooth shapes are expensive members.

Ignorance Costs Money

Lack of gear knowledge on the part of an otherwise able designer and mechanic results in a useless waste of money. The tooth design is such that production cannot keep pace with development of gear cutters and gear cutting machinery. A change is unthinkable because of the difficulties in supplying repair parts. Here is plainly our opportunity. We should to the full limit of our resources get into touch with new design work and then without presumption, but with a sincere desire to solve the problem for the best interests of all concerned, offer our best engineering advice. It is here suggested that when possible (and it will be in most cases) a tooth shape be recommended which may be readily produced on up-to-date machinery, commonly available.

Fig. 1 shows a coupling of unusual design which transmits power through the engagement of external and internal gears, having an equal number of generated in-

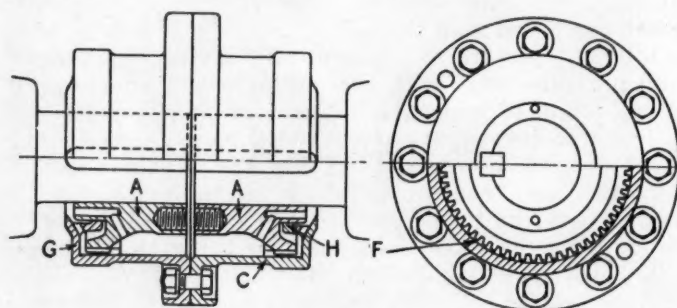


Fig. 1 (above)—Shaft coupling employing involute teeth

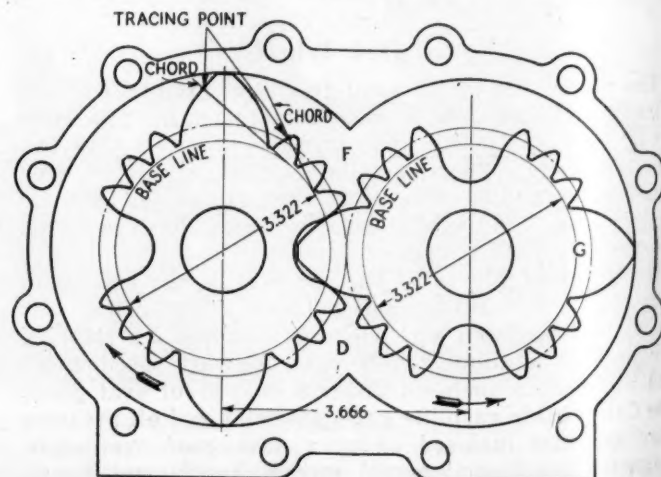


Fig. 2 (right)—A new type of gear pump

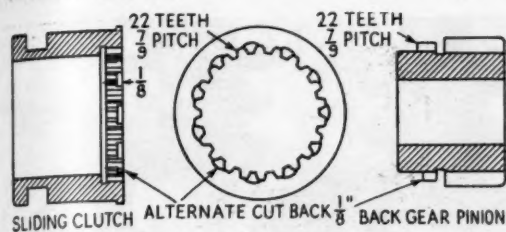


Fig. 3—Positive clutch comprising a spur gear and an internal gear

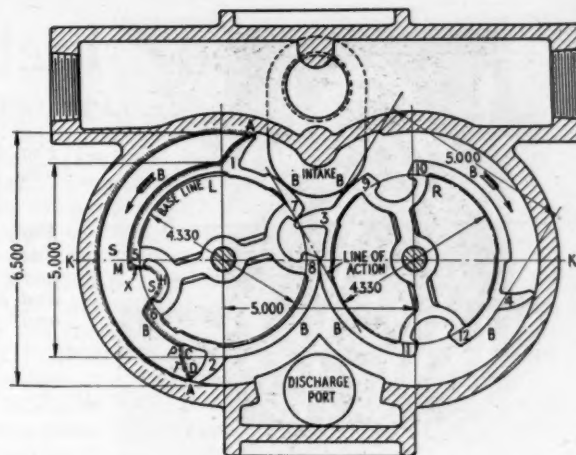


Fig. 4—A fluid-measuring device making use of involute surfaces

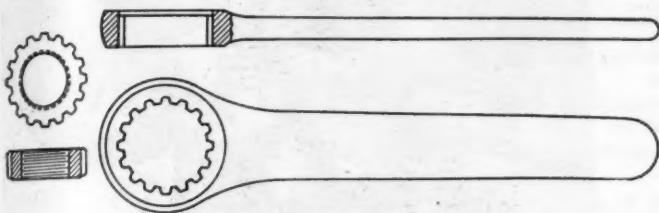


Fig. 5—Wrench and nut with involute gripping surfaces

volute teeth. The hubs A are keyed to their respective shafts as shown, and each carries an external gear at the extremity farthest from the shaft end. The surrounding casting C carries two internal gears which engage the externals. Thus the teeth F of the engaging gears act as so many teeth for the transmission of power. Controller rings G and H positively locate casing C with respect to the center of the shaft which carries the engaging external gear. This assures the best possible position of the engaging gears at all times. It is obvious that teeth of various shapes might be employed for this coupling, but it appears that involute teeth are more easily produced than other shapes.

Fig. 2 shows a pump which represents a development of the ordinary gear type of pump. The impellers are a close running fit in the bore, and the small teeth act as a seal against the escape of liquid. Since there are two impellers and each is two-lobed, the pumping capacity per revolution of the impeller is approximately four times the volume of the individual space between the two impellers and the housing. While the sealing effected by the small teeth might be accomplished in other ways, it is doubtful if any other means would be as effective and long-lived. These impellers are of bronze and formerly were cast. Recently the maker has employed cut teeth, thereby practically doubling the pumping capacity and incidentally appreciably reducing the cost of production.

An Interesting Design

The gear engineering connected with this impeller has its interests. The diagram in Fig. 4 indicates a center distance of 3.666 inches. Since the impellers are equal, the pitch diameter is 3.666. All of the teeth have been developed from a common base line of diameter 3.322 inches, the curve of the large teeth being a continuation of the curve used for the small teeth. With careful attention to design and production these gears may be run properly together without the influence of outside control. This is a striking example in the use of different portions of involute curves developed from a common base line.

The Hendee Machine Co. on one of their machines used a positive jaw clutch with only six possibilities of entrance*. The shock of the pick-up was taken on three surfaces, since alternate jaws were cut away to permit easy engagement. The teeth were cut on a milling machine, which required an operator to effect the indexing from tooth to tooth. It was felt that this arrangement

was too expensive, and careful attention to the matter resulted in the design indicated in Fig. 3. The sliding clutch carries twenty-two internal involute teeth of 7-9 pitch, 20 deg. pressure angle. The back gear pinion has a corresponding number of external teeth so sized as to easily enter the internal gear. With this new clutch there are twenty-two opportunities for the teeth to enter in each revolution of the driving member—a great operating advantage. Each alternate tooth is cut back $\frac{1}{8}$ in. to permit easy engagement. The pick-up is taken on eleven surfaces which means longer life, and since the clutch teeth are produced on automatic machines several of which are handled by one operator the production cost has been greatly reduced.

Solving a Gear Problem

Fig. 4 indicates a section through a liquid measuring device designed and built by the S. F. Bowser Co. The purpose of this machine is to accurately and rapidly measure a liquid which is drawn in through the opening marked "intake" and expelled at the place marked "discharge." Two rotors, L and R, mounted upon parallel shafts exactly 5 in. apart pump the fluid and at the same time accurately measure it. In order to effect this it is vitally important that the shaft center distance, the bore in the housing and certain surfaces of the rotors be finished most accurately, and extremely small limits of tolerance are established to this end. The mechanism is operated by a hand crank on the right-hand shaft. A pair of precision spur gears of equal size are mounted and keyed to the two shafts. As the crank rotates one rotor, the gears assure equal rotation of the other. Two long, unsymmetrical, involute teeth, project from each rotor. Those on one being denoted by 1 and those on the other by 2, 3, 4. These teeth are diametrically opposite and at their outer extremities are a snug running fit in the bore of the housing. There are also four other involute surfaces on each rotor—5, 6, 7, 8, 9, 10, 11 and 12. The surfaces B are cylindrical and are held to the exact diameter of 5 in. The pitch diameter is 5 in. All involute surfaces are developed from a base line of 4.330 in. diameter. The pressure angle is 30 deg. In the position shown involute 3 of rotor R is in final contact with involute 7 of rotor L. Further rotation will break contact. Surfaces B have just come into contact and provide an effective seal against passage of fluid between the rotors as projections 2 and 4 approach each other positively forcing the fluid through the discharge port indicated. Involute 1 and 2 are in such position that their extremities contact the bored portion of the housing. They have so impounded the liquid that it cannot escape

*While the clutch referred to was used in a machine tool, the argument applies also to the case of the direct drive clutch in an automobile gearset.—Editor.

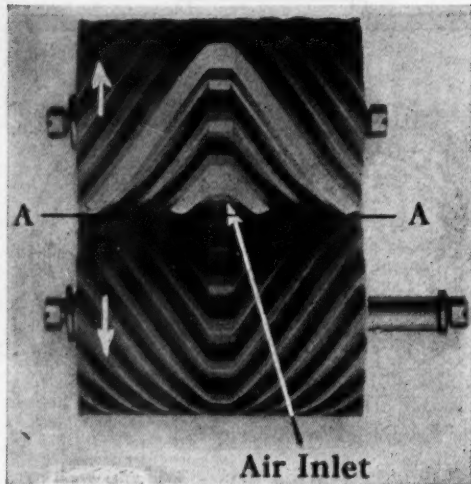
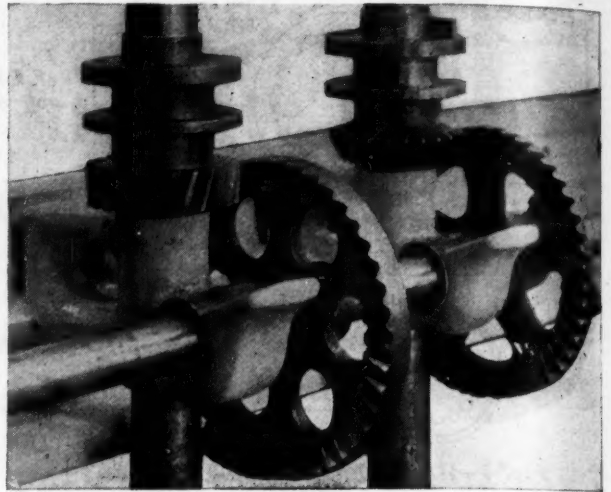


Fig. 6 (left)—A new form of air turbine

Fig. 7 (right)—Cast skew bevel gear (on left) and cut face gear and pinion (on right)



until further rotation brings 2 out of contact with the bore. Further rotation permits involute 1 to drive most of the fluid carried between 1 and 2 through the discharge port. The area of space S (bounded by the bore of the housing projections 1 and 2 and the remaining outline of the rotor) multiplied by the depth, establishes the volume of the liquid carried between the projections. This, however, does not determine the exact capacity of the pump. As involute 2 reaches the line of centers KK it engages involute 11. Involute 12 just clears projection 2, its path being the dotted line PT. At P the cylindrical surface of the two rotors contact, effecting the seal. As projection 2 passes the center line, the fluid in the area bounded by PT and CD passes between the rotors and is not forced out through the port. The dotted line MS defines the sweep of involute 4 as it engages involute 6 indicating the volume displaced and driven through the port. Volumes X and H pass between the rotors as in the case of liquid bounded by PT and CD. It is not necessary that surfaces 5, 8, 9 and 12 be involutes, but it is of vital importance to have them alike on all rotors, insuring not only interchangeability but identical capacity. Involute surfaces are more easily produced than other accurate tooth surfaces. Hence, the use of the involute here. The proper performance is dependent upon several generated surfaces, namely, the bore of the housing, the involute and the cylindrical portions of the rotors. The capacity of this measuring device per revolution of the rotors equals four times the volume of the space bounded by the shaded lines, since there are two rotors and each is two lobed. Gear engineering has here solved a difficult problem and advanced the gear standard.

Wrench Design Illustrated

In Fig. 5 is shown a wrench whose acting surfaces are internal involute gear teeth, together with the mating nut. The diametral pitch is $6 \frac{2}{3}$, and the tooth depth corresponds to 16 pitch. This is a very effective wrench and the sixteen opportunities of engagement are of great advantage when wrench operating space is restricted.

Fig. 6 indicates a pair of rotors which constitute the only moving parts of an air turbine built by the Sullivan Machinery Co. These rotors carry involute helical gear teeth and are disposed as herringbone gears with a short face spur gear between them. In a plane of rotation these spur gears correspond exactly to the helical members. These gears run at pitch line AA. Air is admitted between the teeth through a small hole in the casing. The flow is cut off as the gears revolve, but the air expands until the ends of the teeth run out of engagement. As the gears turn, the pockets between the teeth where air is admitted correspondingly lengthen, allowing

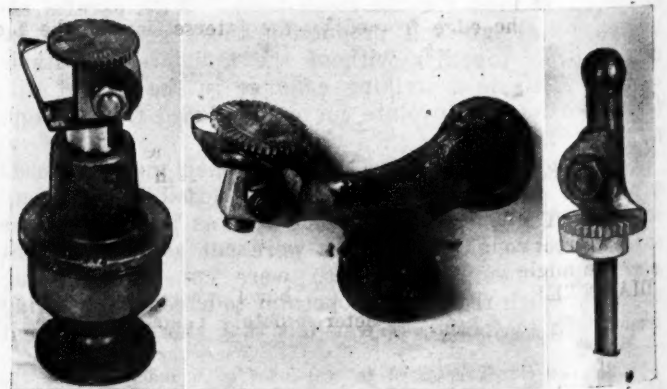
the air to expand several times before released. This turbine, known as the Turbinair motor, is an effective and efficient prime mover—another use for gear teeth.

At the right in Fig. 7 is shown a pair of cast skew bevel gears and at the left a face gear and pinion. In this case the face gear teeth have been spirally cut by a helical cutter corresponding in all essentials to the pinion here shown. The cutter when producing the gear teeth was offset, being located in the position occupied in the illustration by this pinion. The pinion is a helical member.

Improved Valve Adjusting Device

A DEVICE designed to facilitate valve adjustment has been patented by Paul Leo, and applications of it to various designs of valve tappets and levers are shown herewith. It takes the place of the ordinary adjusting screw and its lock nut, and consists of a screw of special form with an S. A. E. thread and a flat head of considerable diameter, which latter is provided with notches on its circumference into which the point of a locking device of sheet steel is adapted to engage. If the screw is of $\frac{5}{16}$ in. diameter, for instance, the S. A. E. pitch for which is 24, the head is made with 42 notches, so that adjustment through one notch corresponds to an axial movement of practically 0.001 in. The screw is locked in place by means of a jam bolt, part of the thread for the adjusting screw being in the shank of this bolt.

In making an adjustment of the valve, the nut of the jam bolt is first loosened, next the adjusting screw is unscrewed until all slack is taken up, then it is backed up four or six notches, according to the amount of clearance desired, and finally the nut on the jam bolt is tightened again. The device serves as an adjusting screw and a micrometer and obviates the need for feelers.



Various applications of Leo valve adjuster

Gear Makers Seek Standard Nomenclature

FOLLOWING are definitions of terms in gearing proposed by the A. G. M. A. Nomenclature Committee. Criticism of these definitions and suggested revisions are invited and should be addressed to T. M. Owen, 2443 Prospect Avenue, Cleveland, Ohio.

(When a dimensional value is given to any of the following terms, it is understood to be based on theoretical conditions and proportions.)

ADDENDUM is the distance, normal to the pitch surface, from the pitch surface to the top of the tooth.

ARC OF ACTION. The arc of action is the angular distance a tooth travels from the point where it first makes contact with its mating tooth until it leaves contact. (Sometimes called angle of action.)

ACTIVE FACE is the length of the working surface of the teeth in the axial plane.

ARC OF APPROACH is the angular distance from the point where tooth contact begins to the pitch point.

ARC OF RECESS is the angular distance from the pitch point to the point where tooth contact ceases.

ADDENDUM ANGLE is the angle between the pitch cone and the face cone in a plane containing the axis. (Also called the increment angle.)

ANGULAR BEVELS are bevel gears which are to operate on shafts having an included angle other than 90 deg.

BACKLASH is play between teeth of mating gears.

BASE CIRCLE is that circle from which a line is unwound to generate the involute curve.

BACKING is the distance parallel to the axis from the crown to a shoulder or hub extension.

BACK CONE RADIUS is the distance perpendicular to the pitch surface from the pitch line to the axis. (This distance is also called virtual pitch radius.)

BACK CONE is the cone generated by swinging the back cone radius about the axis of the gear.

BACK ANGLE is the angle included between the plane of the pitch circle and a plane tangent to the large end of the tooth. (Sometimes called the edge angle.)

BOTTOM LAND is the surface of the gear body between adjacent teeth.

CENTER DISTANCE is the shortest distance between the axes of mating gears.

CIRCULAR PITCH is the distance on the circumference of the pitch circle between corresponding points of adjacent teeth.

CLEARANCE is the shortest distance between the top of a tooth and the bottom of its mating space.

CIRCULAR THICKNESS is the thickness of a tooth along the pitch line.

CHORDAL THICKNESS is the length of chord subtended by the circular thickness arc.

CHORDAL ADDENDUM is the greatest perpendicular distance from the top of the tooth to the chord subtended by the circular thickness arc. (Sometimes referred to as corrected addendum.)

CONE CENTER is the apex of the pitch cone.

CONE DISTANCE is the shortest distance from cone center to any point on the pitch circle. (Sometimes called apex distance.)

CROWN is the edge formed by the intersection of the face cone and the back cone.

CONE CENTER TO CROWN is the distance parallel to the axis from the cone center to the crown of gear.

DEDENDUM is the distance, normal to the pitch surface, from the pitch surface to the bottom of the tooth space.

DIAMETRAL PITCH is the number of teeth divided by the pitch diameter in inches.

DEDENDUM ANGLE is the angle between the pitch cone and the root cone in a plane containing the axis. (Also called the angle of decrement.)

DIAMETER INCREMENT for bevel gears is the amount added to the pitch diameter to obtain the outside diameter.

FACE ANGLE is the angle between a plane tangent to the top of a tooth and the axis.

GEAR RATIO is the number of teeth in gear divided by the number of teeth in pinion, or number of threads in worm.

HELICAL GEAR is one in which the teeth are formed along a helix. (Helical gears may run on parallel axes, in which case one gear has a right hand helix while its mating gear has a left hand helix. Helical gears may also run on axes which are not parallel. In these cases the helices of both gears may be of the same hand. Such gears are commonly miscalled "Spiral Gears.")

HELIX ANGLE. The helix angle of a helical gear is the angle between the helix at the pitch line and the axis of the gear.

HERRINGBONE GEAR is a gear composed of two helical sections, one right hand and the other left hand.

INTERCHANGEABLE GEAR SYSTEM is one which permits gears of any tooth numbers of the same pitch to run together.

INTERFERENCE means contact between mating teeth at some other point than along the line of action.

LINE OF ACTION is the line along which all action between mating teeth occurs. (On correct involute gears this line of action is the common tangent to the base circles of mating gears. This line is also called the path of contact.)

LONG AND SHORT ADDENDUM TEETH have a longer addendum on the teeth of one member than on those of the mating gear.

NORMAL CIRCULAR PITCH is the distance on the pitch surface along a helix perpendicular to the helix angle of a helical gear from one tooth to the corresponding point of the adjacent tooth. (It is commonly miscalled the normal pitch.)

NORMAL DIAMETRAL PITCH is that which corresponds to the normal circular pitch.

NORMAL PITCH. The involute normal pitch is the normal distance between two successive and corresponding involute tooth surfaces. (It is equal to the circular pitch multiplied by the cosine of the pressure angle.)

NORMAL PRESSURE ANGLE is the angle included between a line perpendicular to a normal tooth profile at a point on the pitch surface and a plane tangent to the pitch surface at that point.

OUTSIDE DIAMETER is the diameter of the greatest circle which contains the tops of the teeth.

PITCH ANGLE is the angle between a plane tangent to the pitch cone and its axis.

PITCH CIRCLE is the circle formed by the intersection of the pitch surface and a plane perpendicular to the axis.

PITCH DIAMETER is the diameter of the pitch circle.

PITCH POINT is the point of tangency of the pitch lines of two mating gears.

PITCH LINE ELEMENT is a line, curved or straight, on the pitch surface, formed by the intersection of the tooth and pitch surfaces.

PRESSURE ANGLE is the angle between the line of action and a line tangent to the pitch surface at the pitch point.

ROOT ANGLE is the angle between a plane tangent to the bottom of the tooth space and the axis.

STRAIGHT BEVEL GEAR is a bevel gear whose pitch line element is a straight line.

SHAFT ANGLE is the included angle between the shafts upon which a pair of bevel gears operate.

TOP LAND is the surface of the tooth which is farthest from its supporting body.

TOOTH BEARING is the area of the working surface of a tooth which has contact with its mating tooth.

TOOTH TOP is a line in the top land joining the tooth faces.

TOOTH BOTTOM is a line in the bottom land joining the tooth flanks.

TOOTH FACE is the surface between the pitch line and the bottom of the tooth space.

TOOTH FLANK is the surface between the pitch line and the bottom of the tooth space.

TOOTH FILLET is the fillet at the bottom of the tooth flank joining the bottom of the tooth space.

THROAT INCREMENT for worm gears is amount added to the throat diameter to obtain the outside diameter.

Improvements Made in Boring Machine

Multiple spindle tool designed for production use. Heads are detachable. Arranged for either belt or motor drive. Simplicity and compactness are chief features claimed for construction.

FOR use in boring and reaming automotive cylinders and for the performance of miscellaneous boring operations on a variety of other work, the Foote-Burt Co. has developed the multiple spindle boring machine illustrated in Fig. 1.

The new design is said to represent a considerable improvement over previous Footburt machines for the same class of work. This equipment is intended for use on production jobs, where parts such as cylinders, sleeves, etc., are to be machined in quantity. For this reason the spindles are set at fixed centers and the speed and feed are usually worked out to meet the requirement of the particular job to be handled.

In some cases users wish to do two or more boring operations on the same machine. To meet such requirements the heads are made detachable and are bolted to the rail, which is provided with T slots. To change the detachable heads on the machine the bolts and dowel pins are loosened and the couplings which connect with the main drive of one side of the machine and with the feed mechanism at the opposite side are disconnected. Then the head to be used is placed on the machine and the drive arrangement coupled up again.

The jig plate holding the bushings for guiding the spindles is also easily interchanged and, of course, when

changing heads it is necessary to replace this jig plate with one designed for the head in question. This interchangeability of heads provides for using the same machine on new boring jobs which may come up from time to time by simply purchasing new heads and jig plates.

These machines can be arranged for either belt or motor drive, the machine shown in the illustration being provided with individual motor drive. When belt drive is used either tight and loose pulleys, or a cone pulley drive, can be furnished. The necessary adjustments of speed to compensate for variations in the hardness of castings, etc., are obtained by regulating the speed of the variable speed motor or by shafting the belt on the cone pulley.

Power Transmission Described

From the motor, power is transmitted through reduction gears to a main driving shaft in the head, the reduction gears being located in the gearcase A. There are two worms AA, shown in Fig. 2, mounted on a main driving shaft, which transmits the motion to two worm wheels BB, located near the top of gearcase B.

The following description applies to a six-spindle head, but the arrangement for other numbers of spindles is similar. For the six-spindle machine each worm wheel is mounted at the top of the middle one of a group of three spindles, and under the worm wheel is arranged a spur gear, which transmits power to spur gears mounted at the top of each of the other two spindles in the same group.

These spur gears have their faces divided into two sections, the teeth on one section being of coarse pitch, to carry the load, and the other section of finer pitch, to

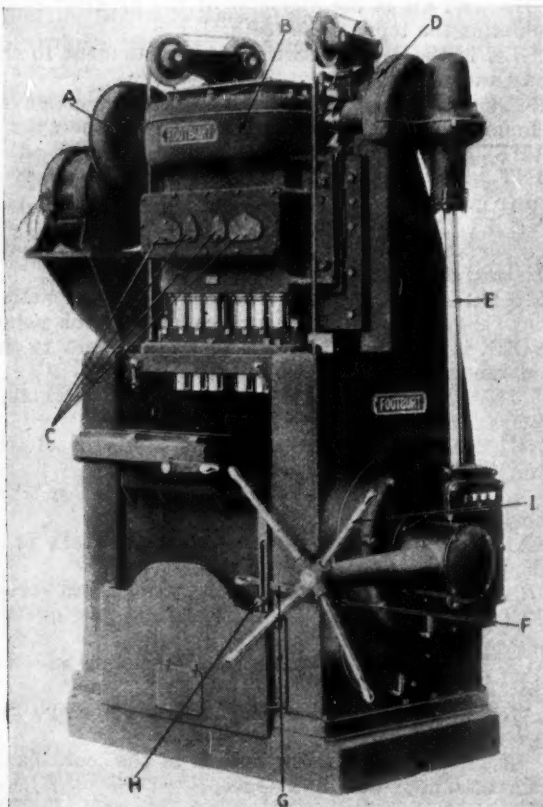


Fig. 1—Foote-Burt multi-spindle boring machine

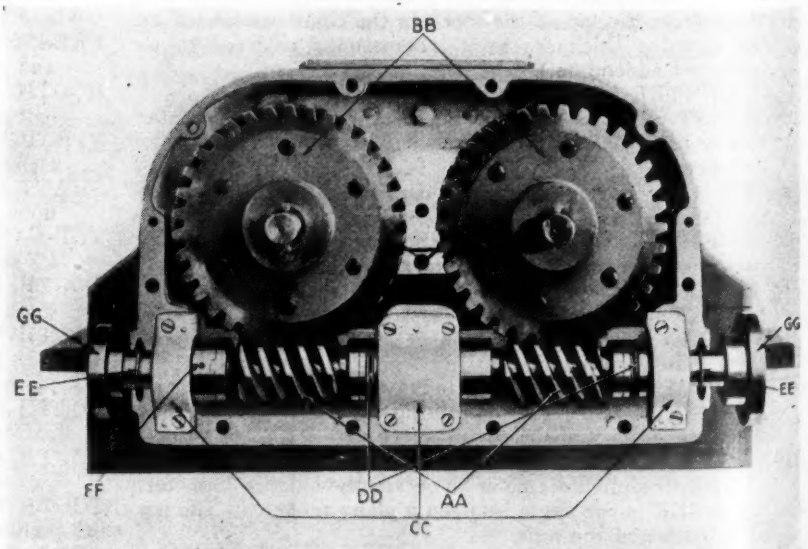


Fig. 2—Reduction gears of boring machine

divide up the points of contact, thus assuring a smooth running drive.

The main driving shaft carrying the worms AA is mounted on roller bearings and is also provided with ball thrust bearings to carry the end thrust of the worms. Each spindle is carried by adjustable tapered bronze bearings and the endwise load is taken by ball thrust bearings. The spindle head is lubricated by a force feed system by means of a geared pump located at the rear of the head crossrail.

On these machines the head occupies a fixed position and the feed is accomplished by raising the work table. Four feeds are provided by means of two sets of pickoff or transposing gears, mounted in a gearcase D, in which all of the mechanism runs in oil. Power is taken from the main driving shaft in the head and carried through the spur and bevel gears to the vertical shaft E, at the lower end of which there is a knockout worm meshing with the worm wheel. On this worm wheel shaft there is a spur gear meshing with a second gear carried on the shaft running transversely through the machine. This shaft carries pinions meshing with racks at either side of the table, so that their rotation causes the table

to be raised and carry the work up to the tools in the spindles. Raising hand lever F throws the knockout worm into engagement with the wheel and makes the power feed operative. When lever F is raised, it is latched at the upper end of bell crank G, and when in that position holds the worm in engagement with the wheel, resisting the tension of a spring which tends to throw the worm out of engagement.

Secured to the work table there is a slotted bar on which the feed trip may be set in any desired position. When the table is fed upward to the end of the stroke, the trip H engages bell crank lever G, and by rocking this lever causes the latch to release hand lever F. Then the spring throws the worm out of engagement with the worm wheel and stops the feed. Capstan wheel I provides for adjusting the position of the table by hand. It will be seen that the table is counterweighted. Steel cables connected with the table carry counterweights, which slide in cylindrical guards mounted at the back of the machine.

Simplicity and compactness are claimed as features of the design, and all parts of the mechanism are thoroughly protected.

Graham Adds Improvements to Truck Model

GRAHAM BROS.' trucks now coming through production at the factory show a number of new features which are in the line of refinements to mechanical parts and features to insure greater comfort for the driver.

The new frame is stronger to prevent possible distortion from rough and heavy road work. A front bumper is provided and this is made very strong and rigid so that it can receive a severe shock without damage. A rear tire carrier is provided below the rear of the frame; this being so designed that it is easy for one man to lift the tire on or off the carrier.

A new three-point suspension of the propeller shaft bearing prevents distortion.

A change has been made in the location of the battery box, which is now under the left side of the driver's seat.

Both first and second spring leaves are wrapped so that in case of breakage of the first leaf the second leaf carries the load until repairs can be made.

A number of improvements have been made in the cab. The seat cushions have Marshall springs and are padded and covered with genuine leather. A high vision windshield permits a comfortable and natural position when driving.

Appearance Improved

Changes in the hood, cowl, lamps and fenders result in a more pleasing appearance. Slight improvements have been made wherever possible in the twenty-six bodies which are standard to the line and several new bodies designed to meet new business conditions have been designed and are starting in production.

A 14-passenger-Sedan bus is one of the new bodies.



One of the twenty-six bodies on the new Graham Bros. truck which has been refined in a number of details to provide for greater driver comfort and better appearance

Reclaimed Rubber in Tires

A COMPLETE investigation is to be carried out by the Bureau of Standards on the effects of various percentages of reclaimed rubber in the material used for automobile tires. This program will commence with a series of service and laboratory tests to determine the relative resistance to abrasion of tires having various percentages of reclaimed rubber in the tread stock. For carrying out this part of the work, 50 experimental cord tires have been secured, these tires having the tread made up in four sections containing 0, 10, 18 and 25 per cent of reclaimed rubber. Forty of these tires will be tested on delivery cars belonging to the Post Office Department and operating on different types of roads. Preparations have been made for laboratory abrasion tests of the four tread stocks, using machines of four different designs. The object of this particular work is to compare the results given by each machine with the results of road tests and to select for future use that type of machine which gives the best results.



The FORUM



American Fire Apparatus Greatly Superior to French

Editor, AUTOMOTIVE INDUSTRIES:

In a recent issue of AUTOMOTIVE INDUSTRIES there appeared an article about a new French fire engine that possessed many interesting features. The account and the illustrations were certainly most attractive and would tend to make the American automotive engineer feel that we on this side are way behind the French.

I have read the article several times and, because I was certain that it was misleading, I have spent several hours in proving the figures and in checking them with my own records and that of general American practice. Comparative figures show that the French are trailing along several years behind us and in justice to American engineers and that large body of your readers who have felt secure in the protection offered their worldly goods by American apparatus, I am sending you the data.

There are hundreds of "engines on wheels capable of delivering this immense amount of water." A discharge of 80,000 gal. per hour is only 1333 gal. per min., and as long ago as 1910 at least one manufacturer was putting out a 1400-gal. machine. At the present time, I think American manufacturers confine themselves to stock machines of about 1000 gal., and so we find in the Ahrens-Fox catalog piston pumps up to 1200 gal. capacity, in the American La France catalog gear pumps up to 1000 gal., and in the Seagrave list centrifugal pumpers also run to 1000 gal.

But the N. B. F. U. rating is for the discharge at 120 lb. pressure, not at 85 as with the French machine. This brings us to the correct basis for comparisons, which is the water horsepower, or W.H.P.

W.H.P. = $\frac{D \times P}{1728}$ in which D is gal. per min; P is pressure at pump in lb. per sq. in.

From this it can be proved that our 1200-gal. machines show a W.H.P. of 84 and the 1000-gal. machines of 68 as against that of the Paris machine which is only 60.

New York Machines Efficient

New York City has a large number of machines that compare with the French product, and they are scattered about in every city in the country. In 1914 I was a checker at a test made by the delivery engineer of a Seagrave with its two-stage centrifugal pump. Fresh from the factory testers and in the hands of a company expert, the machine delivered 973 gal. against a pressure of 120 lb. In the summer of 1923 I tested the same machine in charge of its driver and found a discharge of 962 gal. at the same pressure. That is a fine example

of maintained efficiency—what is needed in a fire apparatus is not an official test in the hands of experts and with everything arranged, but rather a machine which can make a showing with the local crew at any hour of the day and night. The foregoing speaks well for the American product and for a centrifugal pump—the pump has not been touched in nine years of continuous service, during which time the machine has answered from 40 to 90 calls a year.

Tests Prove Effectiveness

To carry the comparison still further and illustrate by a case which is the more interesting because of its spectacular nature, turn to the tests made by the Ahrens-Fox piston pumper assigned to Company 35 in the N. Y. Fire Department and held early on Sunday morning, July 1, 1917. At this test the machine was stationed at the corner of Broadway and Barclay Street and pumped through two lines of hose to a standpipe in the Woolworth Building and discharged through two lines of hose from the tower at an elevation of 730 feet. Here the great weight of water to be lifted vertically lowered the volume of discharge but greatly increased the pressure carried by the engine—at times this weight was 5 tons. The maximum duty was performed when 372 gal. were being discharged with a pump pressure of 400 lb.—this being a W.H.P. of 86.

Of necessity, such a test could not be carried out long and only when street traffic could be diverted. But twelve-hour tests are frequently held—at chiefs' conventions principally. At the test held off the N. Y. F. D.'s dock at Fifty-seventh Street in 1913 nearly a dozen machines were put through twelve-hour runs at maximum capacity and drafting water from depths varying with the tide, up to 14 feet. The performance of the gasoline engines at this test sounded the knell of the steam fire engine for all time.

The Paris fire engine is capable of road speeds of 40 miles an hour! No one who has seen American machines racing to a fire has any doubts as to their ability to equal that, actually, 60 m.p.h. is nearer their limit whether their weight be four tons or eight, for the driver who opened his throttle wide would attain that speed on a straightaway. Fire apparatus is engined for pumping—this is heavy, steady work, and the same power diverted into speed will carry the machines twice as fast as municipalities will allow.

To be strictly correct, the Paris machine could not make good on the example given—delivering 40,000 gal. per hour at 57 lb. on a 1-in. nozzle 1200 yd. away from the water supply—unless its capacity were 41 per cent greater

than that implied by the 80,000 gal. at 85 lb. The duty represented by the latter is 60 W.H.P., while in the tentative case there is required a W.H.P. of 85½. This 85½ is obtained by working back from the nozzle data and hose length and shows that the pressure at the pump would be 218 lb.

In the matter of gasoline consumption the French machine shows almost unbelievable economy. The basis of comparison must again be the product of gallons and pressure. This gives us the number of gallons at 1 lb. pressure and, reduced to these terms, American machines pump from five to six hundred thousand gal. per gal. of gasoline. The French machine, on the other hand, does nearly twice as much with the same fuel, assuming that the twenty-three-hour test was made at the rating of 80,000 at 85 lb.

However, that fuel economy is not stressed heavily in fire service. Reliability at all times is the prime requisite. And at the Chicago fire the American product was given a surprise test unequalled in history. Of the four makes in service at that fire, two at least went through with perfect records and all of them performed creditably at full capacity in that two to three days of continuous operation. It was a feat worthy of a full page in AUTOMOTIVE INDUSTRIES.

That tentative Paris Opera House fire brings up another point not consistent with good engineering and with fire service. In American practice an engine of 79 hp. is used with a pump rated at 53 W.H.P.—different builders may vary 5 per cent from this, but it represents average practice and makes due allowance for minor engine derangements, friction and other losses. The b.h.p. of the engines, of course, runs higher, but it is found in service that an engine needs all of its reserve to meet the underwriters' acceptance tests at the pump capacity.

Now, that Paris engine is a four-cylinder of practically 5¼ x 6½ in. size. That's only 44 hp. (S. A. E.) and yet they expect to get 60 hp. out of the pump attached—at the 80,000 gal. rating. And when they come to pour 40,000 gal. on the burning Opera House, they have got to put 85 hp. on the discharge side of the pump. I don't say it can't be done, but if it can we American engineers have something to learn and unlearn right away.

DONALD A. HAMPSON.

Combination Brakes Advocated

Editor AUTOMOTIVE INDUSTRIES:

The discussion which has been carried on in AUTOMOTIVE INDUSTRIES for some time in regard to four-wheel brakes has interested me very much. Everybody seems to have a different idea as to how these brakes should be designed and how they should be applied. The articles by Mr. Heldt have served to "clear up the air" somewhat, and his remarks on the transmission brake were, I think, very timely.

The only advantage that I can see in the use of four-wheel brakes is for emergency stopping and, of course, a careful driver would seldom need a four-wheel brake. It is only in rare cases when such a short stop is necessary as the four-wheel brake assures, and generally this is for the sole reason of preventing a serious accident. It would seem, therefore, that as a service proposition the four-wheel brake is unnecessary and, in some cases, may be dangerous.

Mr. Heldt says in his article that the advantages of the transmission brake apparently are not fully realized, and while the writer is not in favor of the so-called band brake for a transmission brake, there is considerable advantage in a disk-type of brake for use as a service brake.

This form of brake is patterned somewhat after a regular multiple disk clutch and can be mounted on a short sub-frame just back of the transmission box with a flexible joint between the brake and the transmission. Then for emergency stops, brakes on the front wheels operated by the present emergency lever can be used.

This arrangement, as I see it, has several advantages. In the first place, a carefully designed and properly applied transmission brake has several advantages over the present rear wheel brakes in that there is no need for equalizing the brakes, and skidding of the wheels is avoided to a very large extent. The present differential in the rear axle is the best kind of equalizing device that can be devised for making both wheels grip the road. Another advantage is in starting on a grade; with the present system of braking on the rear wheels, the members that should rotate to start the car in motion are locked, and it requires careful manipulation to get the car under motion without having it slide backward. In fact, most drivers, unless they are experienced ones, avoid as much as possible stopping on a hill. With the emergency brake on the front wheels, the front wheels are locked but the rear wheels are free to rotate, and the car can be started in motion, pushing the front wheels along until the operator has his car under perfect control. This arrangement of braking has not, to my knowledge, been applied or considered.

DOUGLAS T. HAMILTON.

Braking on Four Wheel Drive

Editor, AUTOMOTIVE INDUSTRIES:

In commenting on the necessity of four-wheel brakes on American cars and the question so often asked: Are all cars not equipped with four-wheel brakes going to be obsolete? I would like to say:

Of course not. Present rear-wheel driven vehicles without front-wheel brakes are going to be used successfully for a good many years to come. Besides there is no real merit in the use of front-wheel brakes as applied to rear-wheel driven vehicles. The use of front-wheel brakes on such vehicles, in fact, is most dangerous for the inexperienced or even the ordinary driver, and particularly so for any nervous person in any case of emergency, no matter what type of front-wheel brake is used or how well these brakes may be adjusted.

Four-wheel brakes or so-called multiple brakes can be safely applied and most efficiently operated only on four-wheel driven or multiple drive vehicles. The application of such a braking system is to be in the reverse manner to that in which traction is obtained. In other words, in braking through the driving mechanism where every wheel is driven, the driving wheels both front and rear retain the free rolling motion when required, which permits free steering and also prevents the skidding of the vehicle.

While we are on the subject of deceleration, or braking, on all fours, I cannot neglect to mention the fact that the more important development of acceleration on all fours or the multiple drive seems to be entirely overlooked. Multiple drive will not only provide for better and safer traction, but also will include safer and more efficient brakes on all fours that can be operated under any condition.

Manufacturers, in my opinion, should improve the rear-wheel brakes they now have, which in a great many cases are insufficient. The addition of front-wheel brakes will not cure poor rear-wheel brakes nor will the combined result of poor rear-wheel brakes together with added front-wheel brakes be of any lasting satisfaction.

P. J. F. BATENBURG.

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Tire Industry Makes Progress

DEFINITE progress is being made by the tire industry straightening out its rather confused merchandising methods. Several activities have been started recently which bid fair to bear fruit in coming months.

The investigation of tire retailing practices, carried on by the Harvard Bureau of Business Research, is perhaps the most important step yet taken. This survey, sponsored by the Rubber Association of America, will develop exactly the information most needed to stabilize tire marketing. No detailed, accurate data have been available heretofore concerning the retail field. Opinions have been doing duty in place of facts for a long time.

Coincident with the beginning of this retail investigation has come a definite attempt to analyze the Rubber Association production, shipment, and inventory figures in greater detail, so as to provide some really practical material for use in planning future factory activities. Long forward strides have been taken already in this direction, and it is to be hoped that even further classifications will be provided in the future. They are needed if maximum value is to be obtained from the figures.

The recommendation to modify spring dating policies, made to Rubber Association members, indicates a growing realization of the important effects of this practice, the abolition of which was advocated by tire dealers in their recent convention. Few dealers at the New York meeting seemed much concerned about seasonal variations in tire sales. The Southern dealers, in particular, seemed to have good business practically all the year round, while some Ohio dealers from small towns claimed that their business fell off only about 20 per cent in the worst winter months.

All of these moves indicate a growing tendency to find out actual facts and to use them as a basis for future marketing plans. Immediate results cannot be expected, but benefits may accrue much more rapidly than some members of the industry are inclined to expect. The trend is very definitely along lines of permanent progress.

Sound Incentives Needed

WORKMEN usually are more efficient in times of industrial depression than in peak production periods, when their activity is most needed. The fact is generally recognized by manufacturers and is the cause of considerable thought among factory managers. The cause of relative inefficiency in good times lies partly in the feeling of economic independence given to the worker by his ability to get another job whenever he wants it. Likewise, his more conscientious work in business depression periods is generated by his fear of losing his place.

Superficially, the solution would seem to lie in providing conditions under which the employee is always afraid of losing his income, and thus scare him into high productivity. Experience has proved, however, that this method doesn't work. Experiments in many plants show that the modern workman responds more readily to the positive incentive of gain than to the negative one of fear.

The worker cannot be blamed particularly for his attitude toward his work under different economic conditions, as is pointed out clearly in an interesting paper presented to the American Management Association last month by N. I. Stone, general manager, Hickey-Freeman Co., Rochester. Stone said:

"The selfish attitude displayed by labor is no different from that shown by the merchant, the manufacturer and the banker, all of whom take advantage of the law of supply and demand to charge more for their commodities or services in times of prosperity than in periods of business depression. The only difference between them and the worker being that while they raise their prices for the same commodities or services, the worker not only charges more for his labor, but does less than what he is paid for."

The problem of industry, then, is to find and use those incentives which have a sound philosophical basis and the possibility of practical application.

Both of these factors must be included in wage systems and personnel plans which are to be successful over any long period of time.

Dealers Not Satisfied with Profits

DEALER relations probably never were so important as they are today. This fact is recognized by both parties at interest but for different reasons. The factory employs dealers to sell cars and the dealer sells them to make money.

The cars are being sold in greater numbers than ever before but dealers generally are not making money. It is estimated that fully half the men engaged in the retailing of motor cars will finish the year with mighty few dollars on the right side of the ledger. In fact, a pathetically large number will be in red ink.

Such a condition cannot go on forever. If dealers haven't been able to make money in the biggest year in the history of the industry they never can unless basic conditions are changed.

It is rather futile to consider where the blame lies. Retailers contend it is the fault of factory restrictions and regulations while the factories maintain the dealers are not good business men. The situation which confronts the industry is a condition and not a theory, however.

In any consideration of the question it should not be forgotten that most of the weaklings in the dealer ranks passed out of the picture in the sad days which followed the bursting of the bubble in 1920, and they have not reappeared. Those who survived must have been fair business men or they could not have survived.

Factories are dealing, generally speaking, therefore, with men who are not unfamiliar with sound business principles. They are pretty substantial citizens and they have the confidence of their bankers. By and large, they are not operating on "shoe strings." That is the reason they want to pull out while they have something left and invest it in some line which promises not only profits but a future.

From the factory point of view it is highly desirable to have a large staff of dealers, each with a territory so small that he will have to cultivate it intensively if he is to make a living. This means greater storage facilities as well as more cars sold.

This reasoning doesn't appeal to the dealer,

however. He contends that his territory has been shaved and shaved again until there is nothing much left. No matter how small his territorial allotment may be, he is required to maintain an attractive place of business and his overhead is so high that it cuts his earnings to the vanishing point. It makes no difference whether he handles exclusively one of the popular lines. In fact, exclusive dealers are uttering louder shrieks than the others.

Losses on used cars are not nearly so heavy as they were, because dealers generally have learned the necessity of "buying 'em right." Part of this leak, which was blamed for all the losses so short a time ago, has been plugged and still the earnings are not satisfactory. What would have happened if the used car lesson had not been learned is horrible to contemplate.

Manufacturers are not unfamiliar with the very serious problems with which their retail sales organization are confronted and they are giving them serious consideration. Some of them admit, confidentially, that there is a distinct reaction against reductions in the size of territories and the constant addition of new names to the dealer roster.

There also are apparently well founded reports that several companies propose to employ the proceeds of manufacturing economies to lengthen dealer discounts rather than to reduce the prices of their products to the purchasers. They seem to have arrived at the conclusion that the dealer needs the money worse than the automobile user.

Time will prove whether or not these reports of longer dealer discounts are well founded, but the mere fact that they are in the air shows that factories are giving greater attention to the needs of their retailers.

It is well that this is so, for the dealer is worse off in point of profits than he ever was before.

There are no exclusive dealer problems and no exclusive factory problems. If, both are to profit in the long run there must be genuine co-operation. Working together, they can triumph over all obstacles.

Big Schedules Rule Factory Operations

Output Ahead of Same Period in
October, Not Counting
Ford's Reduction

NEW YORK, Nov. 26—Continuance of good production programs in plants producing automobiles and motor trucks is indicated in the reports from manufacturing centers for the first ten days of the month. Output during that period, now including Ford operations, is reported to be 8 to 10 per cent higher than for the same period in October.

Ford schedules are reduced from the 185,000 figure last month with a possible aggregate output in November of 165,000. Other major manufacturers will curtail operations some time during the month, due to the usual inventory taking period or the customary decline in sales. This condition, taken in conjunction with the shorter working month, will lower the total output for November below the 365,000 figure reached in October. Early estimates, based on present plant activities and a normal curtailment of operations, indicate that November output will be close to 330,000 as compared with 237,000 last year.

Some Stocking Being Done

Some of this production is going forward to dealers for storing in anticipation of a heavy spring demand, but no effort is being made by producers to force stocks on retailers. Such recommendations as manufacturers have made along this line are founded on the fact that there was a shortage of cars in the spring of the present year due to insufficient stocks on hand.

December probably will show a greater reduction in operations than is experienced this month owing to the holiday season and the number of manufacturers that delay inventory taking until the close of the year. Resumption of high schedules, however, is looked for in January as cars go forward to dealers in greater volume.

Reflecting the general conditions in the industry during October are the reports of parts makers which show a substantial gain in sales that month and a marked improvement in collections. Members of the Motor and Accessory Manufacturers Association show an increase in sales of 16.5 per cent over September, a 20 per cent decrease in notes past due

Business in Brief

NEW YORK, Nov. 26—Warm weather is held responsible for the slower pace of industry at the present time, although there are signs of industrial activity in several centers, especially in those sections affected by the cotton crop. The warm spell undoubtedly has retarded retail and jobbing trade, while distant buying feels the price uncertainties.

Despite the better buying of crude iron and the proposed activities of the railroads, less activity in steel mill operations is noted, although it is a matter of rumor that the Pennsylvania system has placed its order for 200,000 tons of rails for next year's delivery. There is brisk buying of anthracite, but a weakening in soft coal, while in the textile lines woolen mill operations are not very brisk. Raw wool is in better sale and firmer.

Car loadings continue above the million mark, as they have done for the last six months, whereas in the previous peak year, 1920, they held to this mark for only a month. The total for the week ending Nov. 10 was 1,036,067, showing an increase of 291 over the previous week and 91,881 over a year ago.

Bank clearings show an increase of 11.7 for the week ending Nov. 22 over the previous week and of 10.8 per cent over the same week a year ago, the total aggregating \$8,034,426,000. Bank debits increased 20.6 per cent.

Crops have profited by the favorable weather, although in parts of central Illinois and Iowa the corn yields have been disappointing because of the drought. Winter wheat conditions are favorable and cattle are in fine shape for the winter siege.

The stock market showed increased strength and activity.

and a 17 per cent decrease in notes outstanding. Sales were considerably in advance over the same month in 1922. Business in November is entirely satisfactory.

Truck production is continuing on steady levels, with expectations that the month will go beyond the 30,141 reported in October. If such is the case, it will follow the curve of a year ago when the November total aggregated 21,949 as compared with 21,795 in October. September of 1923 showed a production of 28,632. There has been comparatively little deviation in truck output for the last four months.

Hawkins May Enter Gray Organization

Will Retire from General Motors,
Probably After Beginning
of New Year

DETROIT, Nov. 28—Norval A. Hawkins, formerly director of the sales, advertising and service section of the Advisory Staff of General Motors Corp. and since last January general consultant of that organization, will sever his connection with General Motors. While no date for his retirement has been announced, it is understood that he will step out about the first of the year.

As to his new connection, Hawkins will not state at the present time what it will be. That is something that will not be made public until he closes his desk in General Motors headquarters for the last time, but it is said that he has no intention of retiring from the industry. It has been whispered about that he may become an executive of the Gray Motor Corp. of Detroit, but that rumor has not been confirmed either.

Leading Ford Executive

Hawkins long has been a prominent figure in the automobile industry, gaining a big reputation when he was one of the leading executives of the Ford Motor Co. Following his retirement from that organization, he busied himself with his private affairs until, following the change of control of General Motors from Durant to du Pont, he became director of the sales, advertising and service section of the Advisory Staff of General Motors, which he held up until last January.

G. M. Acceptance to Pay Dividend of 8 Per Cent

NEW YORK, Nov. 28—Following the action of the board of directors of the General Motors Acceptance Corp. yesterday in declaring a dividend of 8 per cent for the year 1923, payable Dec. 15, it announced that the volume of business handled from Jan. 1 to Sept. 30 this year aggregated \$160,814,000, and it is expected that the total for the full year 1923 will approximate \$210,000,000.

From inception in 1919 to Sept. 30 last, the corporation handled \$498,500,000 of business. Outstanding receivables Sept. 30 totaled \$59,554,000, and the loss experienced on the total business to Sept. 30 was 21/100 of 1 per cent. Credit reserves are approximately \$900,000.

It is expected that net earnings for the full year 1923 will be slightly in excess of \$1,200,000.

Merger Talk Involves Studebaker-Maxwell

Wall Street Stirred by Separate
Meetings of Directors of
Both Companies

NEW YORK, Nov. 28—Whether or not negotiations are under way which will result in the Studebaker Corp. securing control of the Maxwell Motor Corp. is a mystery which Wall Street has been unable to solve up to the present time, despite the fact that directors of both companies held meetings in this city yesterday.

Wall Street takes the rumors more seriously than does the automobile industry, which, of course, is interested in the possibilities of such a merger. It may have been a coincidence that the two boards met at the same time, yet Wall Street feels that the meetings were called for the purpose of acting on the proposition.

It is thought that the Studebaker directors, after considering the matter, had balked at some of the conditions imposed, which resulted in the rumor that the deal was off, following which Maxwell stock dropped ten points on the New York Stock Exchange.

Since the meetings neither side will make any statement, President A. R. Erskine of Studebaker referring inquiries to the Maxwell company, and officials of the latter concern saying a merger with Studebaker had not been discussed.

As the rumors had it, the plan is to offer one share of Studebaker common for one and one-half shares of Maxwell "A," which, with cash, notes and Studebaker stock, would be equivalent to approximately \$68 a share, while the Class B stockholders would receive around \$20 a share.

Consolidation of Studebaker and Maxwell would involve a total capitalization of about \$110,000,000, based on a value of \$10,640,000 for the Maxwell "B" no par shares. Studebaker has a common capitalization of \$75,000,000, while there is \$17,742,300 preferred. Maxwell has 596,872 shares and \$17,742,000 preferred.

Ford Is Not Identified with Leland's Inquiry

DETROIT, Nov. 27—Henry Ford has settled the rumor that the Lelands were gathering information from Lincoln stockholders in order that the Ford Motor Co. might repay them by declaring that "when we paid off those who supplied the company with material we finished our connection with the former company."

In the same interview Ford stated that his company is spending \$110,000,000 in its present construction program.

NEW DEPARTURE EXPANDING

BRISTOL, CONN., Nov. 27—The New Departure Manufacturing Co. has begun

Conservatism Shown in Steel Industry Is Great Need in Parts and Material Supply Field

AN INTERVIEW WITH C. E. COLTON,
Sales Manager of the Schlieder Manufacturing Co.

By D. M. McDonald,
Detroit News Representative of the Class Journal Co.

Detroit, November 28.

SOME of the conservativeness of the steel industry is needed in the field of automobile parts and material supply sources, and some day it is going to come, according to C. E. Colton, sales manager of the Schlieder Manufacturing Co., maker of engine poppet valves. The industry cannot go on forever on the present basis, he declares, and in that thought lies most of the consolation for the parts makers and suppliers in business today.

Conditions in the parts making field border on the chaotic, Colton said. There is hardly a part entering into an automobile which car manufacturers cannot buy more cheaply than they can make. Car manufacturers are taking advantage of the situation to get their supplies as cheaply as they can, with the result that there is little prosperity for the parts makers.

Undoubtedly there has been tremendous business during the present year and undoubtedly there will be a large number of automobiles made and sold next year, but the present basis of cost is too low for general prosperity. In spite of the large business there is bound to be weeding out of companies because it is practically impossible to make money under present conditions and resources cannot stand the strain indefinitely, he declares.

There is no inducement for parts makers to seek to take on new business under these conditions because there is little business that can be taken on profitably. Business is being offered to makers practically all the time but at prices over which they have slight, if any, control. In a good many cases it would be much simpler for the parts maker to write his check at the outset for what he would lose on a contract if he took it, Colton says.

This condition in the parts field is due, according to Colton, to the passing of reductions on car prices along to the parts maker, and the parts maker accepting them to hold the business whether his costs warranted or not. There has come to be only a limited amount of preferred business on which the parts maker can work and make a profit. There is plenty of the other kind but it doesn't mean anything.

So far as parts makers generally are concerned the business has passed for the present beyond the competitive stage and is in the cut-throat stage. The net result is a chaotic condition which fortunately cannot last long but which will last until only those who are most fit are surviving.

There was always enough capacity in the parts field to take care of the actual capacity of the industry, but not enough capacity to take care of business which was ordered two and three times over in the post-war period. This led to over-expansion and is the condition which the parts division is still combating.

"When I say," said Mr. Colton, "that the automotive industry needs some of the conservativeness of the steel industry I have in mind the system under which orders for steel are accepted. Four months is the usual period under which orders are placed, and the steel industry is so stabilized that it is able to control its business to that extent.

"The condition in the automotive industry today reminds me," he said, "of a ball of cord which has become unraveled and twisted into an unworkable mass. For the present that is about all that it is, but there are many hands at work upon it, straightening out a few strands here and there, and after a while we will get the whole mass all untwined and rolled up ready for work again so we can do something with it."

work on an extensive addition to its forge plant. The addition will be one story high, 195 feet x 125 feet wide and will be completed by March 15. It will increase the capacity of the plant 50 per cent. Additional machinery will be installed in some of the other buildings of Plant A at Bristol and Plant D at Meriden, to handle the increased output of the forge plant.

MONTREAL FIXES TRUCK LIMIT

MONTREAL, Nov. 28—The City Council has placed the capacity limit of motor trucks in use in this city at 24,000 pounds, including the truck weight.

C. H. Parr, Tractor Maker, Takes Up New Connection

CHARLES CITY, IOWA, Nov. 28—Charles H. Parr, one of the two founders of the Hart-Parr Co., manufacturer of tractors, has resigned his position with the company to become engineer with the Elgin Street Sweeper Co., Elgin, Ill., manufacturer of motor-driven street cleaning apparatus.

With Charles Hart, Parr laid the foundation of the Hart-Parr company in this city twenty-three years ago this fall. He will assume his new duties in Elgin at once.

Dorris Stockholders to Talk Financing

Will Act on Krenning's Proposal for Sale of Latter's Preferred Stock

ST. LOUIS, Nov. 28—At a meeting of stockholders of the Dorris Motor Car Co., which has been called for Dec. 3, the proposed refinancing of the company will be discussed. The assets of the company at present are valued at \$800,000, with liabilities of but \$55,000.

H. B. Krenning, founder of the original company, who financed Dorris' enthusiasm in the automobile, has demanded that the company buy his interest, which consists of all the preferred stock and which he received in 1916 when the Dorris company's capital was increased from \$50,000 to \$1,000,000.

Stock Value Was \$100,000

Krenning's stock at that time was valued at \$100,000.

When Krenning sold his interest in 1916, he retired from the board of directors, but when no dividends were paid in 1917 he returned to the board.

In addition to Krenning, the board of directors consists of George C. Griffin, Judge Jesse McDonald, Parker W. Woods, Frank C. Thompson, B. H. Chappelow and George P. Dorris, who is the designer of the Dorris car and president of the company.

The difficulties of the company go back to 1916, when the capital was increased. In the following year the company is said to have lost \$97,000. This was the first year of America's participation in the war, and after the war the period of depression caused a loss of \$75,000 in 1921. There was a reported loss of \$75,000 in 1922, and in 1923, to date, there has been a loss of about \$100,000, it is asserted.

Large Profits Paid Once

Krenning says that the company paid large profits in the eleven years from 1905 to 1916, that it disbursed \$87,000 in cash dividends and had \$604,000 worth of assets, which was a profit on the original investment of \$691,000.

George P. Dorris first became interested in automobiles in 1893, and in 1897 he built his first two-cylinder car in Nashville, Tenn. He brought it to St. Louis and formed the St. Louis Motor Carriage Co. and began to build one- and two-cylinder cars.

Krenning bought one of the first cars made by the company, and was so impressed with it that he visited the modest little shop of the St. Louis Motor Carriage Co. and induced Dorris to let him finance the company properly and produce automobiles on a big scale. He gave Dorris \$10,000 worth of stock. In 1905 the Dorris Motor Co. was formed and began building the Dorris car.

Dorris attributes the difficulties of the company to the fact, as he states it,

COOLIDGE SUPPORTS FAIR VEHICLE TAX

WASHINGTON, Nov. 28—Despite a reputation for silence, President Coolidge has taken a definite stand in support of good roads and equitable motor vehicle taxation. In accepting membership in the National Motorists Association, the President said:

"The motor car has been a great promoter of human welfare. It has raised the people and has given them a new outlook on life. There is no reason now for many people to live a shut-in life.

"To experience its greatest fulfillment, the motor industry must be provided with good roads and equitable taxation, and in obtaining these benefits I want to assure you of my most hearty cooperation and support."

This statement of the chief executive gives added emphasis to the growing recognition of the motor vehicle as a utility, and confirms the belief of his predecessor, the late President Harding, who said:

"The motor car has become an indispensable instrument in our political, social and industrial life."

that the company was never adequately financed, that the drop in prices and the high wages following the war, together with the buyers' strike during the period of depression wiped out the surplus of the company and now leaves it without capital to continue business.

He and the other directors believe they will be able to buy Krenning's interest and refinance the company. Dorris looks for future prosperity for the company in building motor buses, several of which have been produced for use in California, and are said to have proved very satisfactory there. Only recently the company received an order for sixty engines from a California motor bus company.

The Dorris plant is fairly modern, and it is the opinion of several experts who have gone over it recently that if properly financed and managed cars could be produced and sold on a paying basis the very first year.

Petition Asks Receiver for Producer of Ogren

MILWAUKEE, Nov. 26—Officers of the Ogren Motor Car Co., Milwaukee, manufacturer of the Ogren Six, have been ordered by the Milwaukee County Circuit Court to show cause why a receiver should not be appointed. The petition for a receivership is filed by the Cleveland (Ohio) Hardware Co.

Fred G. Smith is president; Robert E. Wiltrout, secretary, and Ralph S. Wiltrout, treasurer of the corporation. Operation of the Ogren plant was virtually suspended several months ago.

Hayden Eames Made Manager of Haynes

Succeeds A. G. Seiberling—S. E. Burke Is Successor to Gilbert Radoye

KOKOMO, IND., Nov. 26—Hayden Eames of Cleveland, has been made general manager and S. E. Burke, sales manager of the Haynes Automobile Co. in the reorganization plan which followed recent court proceedings involving this veteran automobile manufacturing concern.

Eames succeeds A. G. Seiberling, who has been the active head of the Haynes company for several years, while Burke follows Gilbert U. Radoye, whose resignation as sales and advertising manager was tendered a few weeks ago. With the announcement of Eames' appointment, it was stated that the start of the campaign for the sale of the \$2,750,000 bond issue has been set for Dec. 7.

The change in management brings back to the industry a man who entered it from the bicycle business, in which he was regarded as an authority on steel. In the early days of Studebaker, when that corporation was experimenting with the Studebaker-Garford and E-M-F, Eames was general manager of the South Bend concern.

Burke comes to the Haynes company from Detroit, where he served as general sales manager of Williams & Hastings, Hupmobile distributor. For fifteen years he has been associated with automobiles in capacities ranging from dealer to factory sales manager.

Erie Creditors to Get 25 Per Cent on Claims

TOLEDO, Nov. 27—Creditors of the Erie Tire & Rubber Co. will receive a minimum dividend of 25 per cent on their claims, according to a preliminary report of the sale, made to Federal Court here by Fordyce Belford, special master, who disposed of the property last week for \$330,100.

The property is now in the hands of the Erie Rubber Corp. of Sandusky, with the Elyria Savings Bank and Trust Co. as trustee.

Adjudicated claims total \$335,785; unadjudicated claims, \$57,515, and attorneys' fees and receivers' expenses, \$82,296. For covering additional expenses of the receiver and unforeseen demands, the sum of \$60,000 will be withheld from distribution.

RAILWAY BUYS BUS LINE

PHILADELPHIA, Nov. 26—The Public Service Railway Co., Camden, N. J., has purchased thirty-one of the 108 motorbuses now operating from the Camden ferry terminals.

Reo May Buy Duplex Factory in Lansing

If Stockholders Approve Sale,
Latter Company Would Move
to Another Plant

DETROIT, Nov. 26—Stockholders of the Duplex Truck Co. will act on Dec. 4 on a proposal to sell the Lansing plant and real estate of the company to the Reo Motor Car Co. and to transfer the truck manufacturing operations to another plant.

No formal statements will be made by officials of either of the plants concerned in the transaction pending the stockholder action, except that for Reo it is part of the company's expansion plans and for Duplex that the company plans continued operations.

If the plan is approved, it is understood that Reo will pay approximately \$200,000 for the Duplex plant. With the additional space it would be in a position to make extensive increases in the output of its general lines. Part of the plant would be turned over to Reo on Jan. 1 and remainder on March 1, Duplex in the meanwhile transferring its operations elsewhere.

In considering future operations, H. M. Lee, president of Duplex, says that the company has a smaller plant at Charlotte, Mich., which has been used by the State Highway Department, but which can be taken possession of if it is decided to manufacture there. The company may also take over another site in Lansing, he said.

Reo officials declared the plant would give them needed additional space situated advantageously with regard to the main plant. Until Duplex stockholders have approved the purchase, no definite statement on the use of the plant would be made.

Petition Federal Court to Name Pilot Receiver

INDIANAPOLIS, Nov. 23—A petition asking the Federal Court to appoint a receiver for the Pilot Motor Car Co. of Richmond, Ind., has been filed here on complaint of five concerns listing themselves as creditors and setting forth claims aggregating less than \$500.

The petition alleges that the company committed acts of bankruptcy by transferring to certain creditors automobiles made by the company in full or part payment for debts contracted, and had also permitted certain creditors to obtain preference over others through legal proceedings.

The concerns signing the petition are the Ashland Products Co. of Ashland, Ohio; the Columbus Bolt Works of Columbus, Ohio; Oak Smith & Sons Co. of Richmond; Oakley Smith, doing business under the name of the Richmond Coal Co., and William Wiese & Co. of New York City.

Early in November, Charles W. Jor-

FOREIGN DEALER LIST TO UNDERGO REVISION

WASHINGTON, Nov. 29—A revision of the list of foreign dealers of automotive equipment is to be begun at once, according to M. H. Hoepli, acting chief of the automotive division of the Department of Commerce.

In order that the list may be as practicable as possible, automotive exporters are being requested to aid in compiling the questionnaire that will be sent to foreign representatives of the Department, who will secure the information in the country where they are stationed.

The list will be compiled in two parts, the first showing a list of jobbers and dealers for automobile supplies, and the other the list of dealers in cars and trucks, showing their nationality, the kind of vehicles they sell, extent of their selling organization, exhibition and storage facilities, their ability to give service, whether or not they do vulcanizing and the side lines handled.

Approximately six months will be consumed in revising the list.

dan, a banker of Richmond, was appointed receiver for Pilot on application of four stockholders to the Wayne County Circuit Court. The stockholders claimed that the company was solvent, but that appointment of a receiver was necessary to conserve company assets.

Warehouse Fire Damages Bodies for Duesenberg

INDIANAPOLIS, Nov. 28—Fire in the plant of the Central Storage Warehouse here damaged a supply of automobile bodies belonging to the Duesenberg Automobile & Motor Co. The loss is fully covered by insurance, and it is believed that many of the open and closed bodies can be entirely redeemed by refinish and upholstery, as much of the damage was caused by smoke.

Chester S. Ricker, general manager of the Duesenberg company, said that recently the company has stored current supplies of bodies in the warehouse to increase the production capacity of the plant.

There may be a few days' delay in production, but it will not seriously inconvenience Duesenberg dealers as other bodies are in process and some are en route by freight.

Recently the company has carried about two months' extra supply of bodies to guard against unexpected delay in body making or transportation, and to save active production space in the final assembly building, the extra supply has been kept in the Central Storage Warehouse.

\$3.73 Share Earned by Reo During Year

Compares with \$2.98 in Last
Fiscal Period—Reports Net
Profits of \$5,603,478

LANSING, MICH., Nov. 26—Profits of \$5,603,478, after Federal taxes, against \$3,140,529 in the preceding twelve months, are reported by the Reo Motor Car Co. for its fiscal year ended Aug. 31, 1923. This is equivalent to \$3.73 a share, par \$10, earned on the outstanding \$15,000,000 capital stock as compared with \$2.98 a share, par \$10, earned on the outstanding \$13,874,500 capital stock in the previous year.

The company's balance sheet is as follows:

Assets: Cash, \$4,549,340; sight drafts, \$765,882; receivables, \$3,818,891; United States bonds, \$202,731; inventories, \$10,135,089; land, buildings, machinery, etc., \$6,442,893; deferred charges, \$180,895; investments, \$299,082, and Reo company stock of Canada, \$47,000.

Liabilities: Capital stock, \$15,000,000; accounts payable, \$2,287,380; accrued payrolls, \$97,528; reserve for taxes, \$1,172,593; deferred credits, \$65,295, and surplus, \$7,819,007.

Kissel to Launch Bigger Output Schedule in 1924

MILWAUKEE, Nov. 26—Discussing the outlook with special reference to the business of the Kissel Motor Car Co. of Hartford, Wis., Elliott B. Field, who recently joined the company as advertising manager, said that sound conditions and national finance point to a year of further prosperity and growth.

The present year showed a marked increase in both production and sales, more cars having been built and more distributors and dealers added than in any previous year. While output has slowed down with the season, a new production schedule greater than any before will be instituted on Jan. 1.

Sales of Kissels in southern California in the first three-quarters of 1923 were 172 per cent larger than in the same period last year, and for the entire State of California the increase was 153 per cent.

Field said that the design was being still further refined at present, but several new and distinctive features which will characterize the 1924 Kissel will not be revealed until the national shows.

OLDS FORCE INCREASED

LANSING, Nov. 26—Announcement is made by the Olds Motor Works that since the debut of the 1924 models more than 1000 new employees have been added to the payroll, 496 new dealers have signed contracts for next year, and two direct factory branches, one in Memphis and another in Dallas, have been opened.

Personnel of Safety Committee Appointed

N. A. C. C. Names Macauley, Jordan, Hardy and Pride as Graham's Associates

NEW YORK, Nov. 27—The personnel of the newly created Traffic Planning and Safety Committee of the National Automobile Chamber of Commerce has been completed. The appointment of George M. Graham, vice-president and general sales manager of the Chandler Motor Car Co. of Cleveland as chairman, was confirmed at the last meeting of the N. A. C. C. directors but it was not until this week that the remaining four members were chosen.

Other members of the committee are the following: Alvan Macauley, president of the Packard Motor Car Co. of Detroit; E. S. Jordan, president of the Jordan Motor Car Co. of Cleveland; A. B. C. Hardy, president of the Olds Motor Works of Lansing, Mich., and George H. Pride, chief of the electric vehicle department of the Autocar Co. of Ardmore, Pa.

The first work of the committee will be a survey of major traffic, following which it will consider the elimination of grade crossings in cities, the possibilities of over-passes or under-passes for pedestrians or vehicles and the possibilities of decentralization. Accidents in rural districts also will be taken up.

Graham realizes that traffic congestion is one of the industry's greatest problems and it is the aim of the committee to cooperate in every way not only with the big municipalities but with the smaller cities and towns in devising ways and means of making it easier for vehicles to operate on city streets and to make the streets safer for the pedestrians.

Railways' Delivery Plan Waits on Utilities Body

DETROIT, Nov. 27—General operation of its container delivery plan by the Detroit United Railways is awaiting final approval by the Michigan Public Utility Commission. Application for a license to operate trucks in conjunction with its rail lines has been made, and hearings are scheduled at which the company will outline its proposed plan of operation.

The D. U. R. has started the operation of three trucks out of Jackson to make possible through shipments to Hillsdale, Coldwater, Sturgis and intervening smaller towns from Detroit within twenty-four hours. The permit for the operation of this route was independent of the application for general operation of the plan and was advanced because of requests from Detroit merchants for the through service.

Shipments to these towns by rail and truck are twenty-five cents a hundred higher than the railroad freight rates, but provide for door-to-door delivery and

complete shipments in one day's time which by railroad would require several days.

Because of haste in starting this line, the company placed in service trucks with regular body equipment. As business grows, the company will add more trucks and will follow this practice of developing all routes gradually. While awaiting the Utility Board's action, the company is continuing its educational work incidental to the introduction of the rail and truck service throughout the State.

United States Senators Would Fix Truck Weight

WASHINGTON, Nov. 24—A limitation on the weight of trucks and their loads is recommended in the Senate's special traffic committee's report, which will be filed next week. The report, dealing primarily with District of Columbia highways, makes a general recommendation, however, that no truck be permitted to operate on highways with a load greater than 22,000 lb.

The committee recommends that every State adopt a limit on truck loading. It is pointed out that the adoption of such a law by States can be forced on the States through the action of Congress withholding future Federal highway aid, until the States have adopted regulations limiting loads.

Figures presented to the committee show that there are now twelve States with a limit of 28,000 lb. This limit allows 7½-ton trucks. Two years is the time suggested to allow such truck owners to get rid of the trucks greater than 5 tons.

Plan of General Motors for Managers Approved

NEW YORK, Nov. 27—Stockholders of the General Motors Corp. have approved the proposal of the directors to organize the Managers Securities Co. for the purpose of giving about seventy of the corporation's chief executives an opportunity to share in the profits through the acquisition of common stock.

Following this action a charter has been filed in Delaware for the Managers Securities Co., with a capital stock of \$38,000,000, the incorporators being Pierre S. duPont, John J. Raskob and John T. Smith.

Nu-Cord Reorganized with Myers President

JEANETTE, PA., Nov. 27—Reorganization of the Nu-Cord Tire & Rubber Co., which has plants in West Jeanette and Greensburg and which went into a receivership several years ago, has been completed. A charter has been applied for with capital stock of \$150,000.

J. E. Myers has been elected president; Dr. E. L. Piper, first vice-president; Luther F. Edwards, second vice-president, and J. L. Kennedy, secretary-treasurer. The factory superintendent is P. A. Maples.

Adams Axle Operates in Syracuse Factory

Building for Star There—Findlay Plant Will Handle Other Durant Needs

SYRACUSE, N. Y., Nov. 29—The Adams Axle Co., a Durant subsidiary, today began manufacturing axles for the Star car in what was formerly the plant of the Monarch Typewriter Co. The Syracuse plant will employ about 600 men. Work of equipping it has been in process since last spring.

The company will handle the entire business of manufacturing axles for the Star car, taking the business formerly done at the Adams Axle factory in Findlay, Ohio. That factory hereafter will be devoted to manufacturing axles for other automobiles produced by Durant Motors, Inc.

G. M. Carter, president of the company, has established his residence in Syracuse and will give his personal attention to the new Syracuse industry. Production at the plant is to be gradually expanded, he says, so that by early spring the plant will be turning out 1000 sets of Star car axles daily.

The building which houses the new industry was bought by the New Process Gear Co., controlled by Durant, and became the company's No. 3 factory.

Says Japan's Great Need Is Truck Transportation

PHILADELPHIA, Nov. 28—Stanley E. Stady, formerly advertising manager for the International Harvester Co. of America in Philadelphia, and until Sept. 1 advertising manager of the Japan Advertiser in Tokio, told the members of the Motor Truck Association of this city that truck transportation is one of the crying needs of Japan.

He stated that in 1922 there were only 12,000 motor vehicles—passenger and commercial—in Japan and that 3000 of this number were trucks. A drawback to the motor car business in Japan, before the temporary lowering of import duties became effective, he said, was that by the time the vehicles arrive from America, the price was about doubled over the factory prices in this country. He added that the local taxes in Japan for car operation are excessive, being about \$200 a year for a car in the \$500 class.

BEST NASH OCTOBER

KENOSHA, WIS., Nov. 26—Nash Motors Co. reports that last month was the biggest October in its history and indications, it says, point to an unusually large business in November. October sales showed a 10 per cent increase over the same month last year. Actual figures were 4245 passenger cars shipped last month as against 3828 cars in October, 1922.

New German Truck Will Be Built Here

Company Organized for Front-Wheel Drive Vehicle with Hydraulic Control

NEW YORK, Nov. 26—The Hydraulic Transmission Corp. of America has been incorporated with a nominal capital to manufacture in this country the front-wheel drive truck with hydraulic control, brought out in Germany by the Lippische Werkstätten under the Mayer-Ulm patents. The truck was described in the April 5 issue of AUTOMOTIVE INDUSTRIES.

The new company also will license American concerns to use the hydraulic control. This latter is a hydraulically operated gearset, which is connected directly to a 30 horsepower four-cylinder engine. From the gearset the drive is taken by spur gears to a differential and then by two shafts with universal joints to pinions operating in internal gears secured to the front wheels.

The new company has opened offices at 874 Broadway, this city, with John Keller as president and Hilaire J. Holder, formerly of Chevrolet and Scripps-Booth, as general manager. It is a unit of Kellner-Konzern, Inc., a corporation which is operating twenty-two manufacturing concerns in Germany and which has started similar operations in this country.

The truck factory has not been selected as yet, but the company has on exhibition one of the three-ton trucks brought from Germany.

New Moon Car, Soon Due, Will List Below \$1,000

ST. LOUIS, Nov. 28—The Moon Motor Car Co. will build 25,000 cars in 1924, according to announcement made by President Stewart McDonald at the annual distributors' banquet.

A new model to sell for less than \$1,000 will be announced before the New York show.

Fifty-five distributors attended the two-day conference at the factory, and the manufacturing program is based on the cars requested by the distributors.

Proposed Car Discussed by Vigilance Committee

NEW YORK, Nov. 26—In reporting on the stock-selling efforts of the promoter of the J. C. N. Noel Motor Car Co. of Jersey City, N. J., capitalized at \$10,000,000, the National Vigilance Committee in its Truth-in-Advertising Bulletin, says:

A few of the innovations promised for the Noel Duplex springless car include four-wheel driving and steering; springless frame with air cylinders; air-cooled valveless motor operating on compressed air and gasoline, changing automatically; absence of foot pedal and steering wheel, same being replaced by an air-pressure lever; tires in six-

"BALLOON" TIRE NAME OFFICIALLY ADOPTED

NEW YORK, Nov. 26—The Tire Executive Committee of the Rubber Association of America has formally adopted "balloon" as the uniform designation for the low-pressure, thin side-wall type of tire, and the word will be registered.

Abroad the word "cushion" will be used to designate this type.

teen sectional parts; sliding doors and disappearing steps; the only non-glaring automobile lamps in the world and the Noel locking system.

This car, which appears well on paper, is to be done in a nine-passenger parlor car model in circassian walnut or mahogany or velour upholstery. The speed may be graded from three miles to one hundred and fifty miles per hour, and fifty miles per gallon of gasoline is assured. It operates backward with the same speed and facility, and the steering apparatus controlling four wheels instead of two may be operated from the exhaust as well as by compressed air.

No mention is made of the price to be asked or is any assurance of production given.

Canadian Price of Ford's New Phaeton Put at \$445

DETROIT, Nov. 28—Ford Motor Co. of Canada, Ltd., is now building the models recently announced in the United States at the following list prices: Runabout, \$405; phaeton, \$445; truck \$495; coupé, \$665, and Fordor sedan, \$895. Prices on the open models and truck are without electric starter, which is \$85 additional.

The first lake freighter to unload at the new Ford of Canada docks dropped off 10,000 tons of coal in less than eight hours. The coal was shipped from Toledo. Ability to unload large quantities of coal quickly at the new million dollar docks will make savings in freight rates which, it is estimated, alone will pay for the docks within a few years.

Rauch & Lang Producing Electric Delivery Wagon

CHICOPEE FALLS, MASS., Nov. 28—Rauch & Lang report encouraging interest in their electric delivery wagon, which they are now bringing into production. This is designed to meet the demands of certain lines of trade seeking a light car of refined appearance for delivery purposes. It has the same chassis and general body lines as the electric taxicab.

In the passenger line the company is bringing out the Chesterfield brougham, Model B-68, with improved body design and batteries of increased capacity. The factory price is \$4,250, or \$100 extra with wheel instead of tiller steer. A Victoria roadster model with custom-built bodies and wheel or tiller steer, as preferred, price \$4,500, is to be brought out in time for the New York show.

McFarlan Produces Smaller Six Model

Added to Regular Line—Engine Is Overhead Valve Type—Wheelbase, 127 In.

CONNERSVILLE, IND., Nov. 27—An additional model, a small six, has been announced by the McFarlan Motor Corp. of this city. The engine has a bore of 3 3/4 and a stroke of 5 in. (268.3 cu. in.) and is of the overhead valve type. Cylinders and crankcase are cast in a block. A Rayfield carburetor and Delco battery ignition are used. The clutch is of the dry-plate type comprising two Raybestos and one steel plate. A three speed forward and reverse gearset is combined into a unit with the engine.

The rear axle is of the semi-floating type, with a reduction ratio of 5.1 to 1. Drive is by spiral bevel gears and all shafts are mounted on double row ball bearings. The axle clearance is 9 1/4 in. Under the I section front axle the clearance is 10 1/4 in., and the steering tie rod is located back of the axle. Semi-elliptic springs of vanadium steel are used throughout, the front springs measuring 39 by 2 and the rear, 58 1/2 by 2 1/4 in. The steering gear is of the cam and lever type and provided with an 18 in. wheel.

Brakes of Contracting Type

The frame is very rigid, comprising side members of channel section 7 in. deep and of 5/32 in. stock. There are six cross members. The service brakes act on the rear wheels and the emergency brake on the transmission. All brakes are of the contracting type and the drums of the wheel brakes are 16 in. in diameter. Wood wheels are used, fitted with 32 by 4 1/2 non-skid cord tires on Firestone demountable rims.

Equipment includes a Delco two unit type starting and lighting system, a 75 mile speedometer driven from the rear of the gearset, a 6-volt 120 ampere-hour storage battery, the usual lamps, etc. The gasoline tank at the rear of the frame holds 19 gal. and it is claimed that the car can be driven from 16 to 18 miles on a gallon. The wheelbase is 127 in.

U. S. Will Build Royal Cord Tires for Trucks

NEW YORK, Nov. 28—The United States Tire Co. has announced a new Royal cord pneumatic tire for bus and truck applications. In addition to embodying the Royal cord tread design in a truck tire for the first time, this tire also utilizes web cord and sprayed rubber, two developments in tire manufacture recently put into production by the same company.

Each cord in the carcass is given a bath in rubber latex, pure virgin rubber in the liquid form in which it comes from the rubber trees. Tread and other rubber parts of the new tire are made of sprayed rubber.

Citroen to Purchase More Machinery Here

**Purchasing Commission Coming
—Americans Taking Big Part
in Factory Work**

PARIS, Nov. 17 (by mail)—American firms and engineers are playing an important rôle in the plan developed by André Citroen to increase his production from the present figure of 140 to 200 a day by March, 1924, and to 250 cars a day by 1925. The program now in hand provides for an expenditure of 25,000,000 francs, two-thirds of this amount being for American machinery.

When this work is completed, in one year's time, Citroen declares that he will have a capacity of 250 cars per 8 hours, and he is firmly convinced that this number can be marketed. It will be an easy matter to run two shifts a day, thus carrying the factory capacity to 500 cars, if there is a demand for them.

Production to Mount

With the advantage of price reductions his modern plant will give him, and on the assumption that general economical conditions will not undergo serious changes, Citroen counts on producing 350 cars per day in 1926 and 500 a day before 1930. The French manufacturer is working on the American plan of progressively reducing cost of production and thus bringing automobiles within the purchasing range of additional buyers.

The work now going on at the Citroen factory comprises an entirely new iron, malleable and aluminum foundry covering an area of 335,000 sq. ft. and planned to be in full operation by the end of 1924. The contract has been given to the H. M. Lane Co. of Detroit, the erection being under the personal supervision of H. M. Lane, acting as consulting engineer and of his partner A. O. Thomas. The works manager is W. Ruddy.

U. S. Engineers on Hand

Forge shops, equipped with twenty Erie hammers, of which three are now working and all of which will be in operation by the end of 1924, are being erected under the control of A. R. Smith, consulting engineer of Detroit. A black stove enamelling plant has been erected by the Young Brothers Co. of Detroit, under the supervision of the firm's engineer, H. M. White, who recently returned to the United States.

The Carrier Engineering Co., Ltd. of London is erecting, under the control of Engineer Modiano, two big series of drying ovens, twenty-two of which will dry the seven first coats at 70 deg. C. instead of at 30 deg., the time being cut from fourteen to three hours. Fourteen

other ovens will dry the varnish coat in four hours.

The Palmer Bee Co. of Detroit, is so far advanced on the installation of an up-to-date American conveyor system that the firm's engineer, H. H. Morgan, has been able to return to the States. Some of the conveyors are already working and all will be completed before May of next year.

In addition to the complete plants for foundry, forge, stove enamelling, drying, and conveyors, ordered as the result of his visit to America this year, Citroen has placed orders for 1200 machine tools of various kinds, of which 600 already have been delivered, and he intends to purchase 600 more.

A purchasing commission is at present in England, and another one will leave for the United States in a few days. Three-quarters of these machines will be of American construction, the leading supply firms being Brown & Sharp Manufacturing Co., Landis Tool Co., Norton Co., Potter & Johnson Machine Co., National Acme Co., Cincinnati Hi-Speed Machine Co., and Pratt & Whitney Co.

(Continued on page 1132)

Packard Pays Employees \$300,000 Profits Bonus

DETROIT, Nov. 27—The Packard Motor Car Co. is paying bonuses totaling \$300,000 this year to all employees and officials who have been with the company five years or more, the rate being \$10 for each year with a maximum of \$100 for all those in service of the company ten years or upward. The bonus, officials declare, is paid customarily when profits of the company are considered as warranting it, and is in addition to the regular group bonus plan for employees, which is based upon department efficiency.

In connection with the profits bonus, it is stated that company records show more than 12 per cent of men employees with the company ten years or more. Twenty-seven per cent of men and 28 per cent of women have been in continuous service five years or more. Labor turnover is 10 per cent. Numbered among the ten year men are practically all major executives.

Kokomo Fire Destroys Commercial Airplanes

KOKOMO, IND., Nov. 28—Sixteen commercial airplanes, thirty motors and a quantity of fuselage, wing and other equipment were destroyed by fire yesterday when a hangar, owned by the Kokomo Aviation Corp., was burned. The hangar was one of three owned by the company at Wilbur Fagley Field, near the city. Defective wiring is thought to have been the cause.

Two steel covered hangars near the fire were not damaged. In these were eleven army planes belonging to the 113th Observation Squadron of the Indiana National Guard. Two planes were pushed out of the hangar before they were damaged.

Paige-Jewett Adopt Weekly Buying Plan

**Delivery of Either Car to Be Made
on First Payment—Applies
to Trade-In**

DETROIT, Nov. 26—Details of a selling plan are being perfected by the Paige-Detroit Motor Car Co., whereby dealers will be enabled to sell its products, Paige and Jewett cars, on a weekly payment plan, in which the buyer is delivered a car with the first weekly payment.

It is expected to reach many first buyers and eliminate much trading in. In cases where cars are traded in, their resale will be handled also on the weekly payment plan, with delivery accompanying the first payment. So far as it is possible, it is expected to make the sale of Paige and Jewett cars available everywhere on this basis.

First operation of the plan was started in Detroit this week through the Paige Sales & Service Co., distributor in this territory.

The rate of payment has been fixed at \$24 a week on a Jewett open model, with higher rates according to higher priced models. Delivery is made on first payment, and complete payment is made in the year. The carrying charge is somewhat higher than under usual time payment plans, but the dealer is fully protected.

The plan is the outgrowth of a plan for selling used cars which has worked out very successfully and which is now being used by a number of other Detroit companies. Distinction is made by the company among purchasers, so that only those whose rate of income and general character is satisfactory are accepted. Difficulty in accumulating usual down payments by persons of steady income is declared the reason for the launching of the plan.

Makers Seeking Payment for War Seized Tractors

ROCKFORD, ILL., Nov. 28—When the German army took possession of Libau, Russia, in one of the early drives on the eastern front during the World War, an officer ordered confiscation of all the tractors in the country.

Now, eight years later, American manufacturers are endeavoring to secure payment of all of the machines owned by them and commandeered by the German government for war purposes.

It is said that the total claims from tractor manufacturers will run into the hundreds of thousands of dollars. These claims are expected to be brought up in Congress at the coming session.

It will be determined at that time whether or not the proceeds from German property, seized, held, and disposed of by the allies, will be utilized to settle claims of this character.

1,684,324
165,122
1,519,202

10 Months' Ford Sales Aggregated 1,684,324

Of This Total, 165,122 Cars and
Trucks Were Marketed in
Export Field

DETROIT, Nov. 28—Total sales of Ford cars and trucks in the export field, including Canada, in the first ten months of 1923 were 165,122, slightly less than 11 per cent of sales in the United States, which totaled 1,522,840 in this period. Combined foreign and domestic sales for the first ten months of the year are 1,684,324.

Totals by each of the thirteen foreign divisions for the ten months are as follows:

Canada and Canadian export..	37,990
Antwerp	11,362
Barcelona	8,543
Bordeaux	11,220
Copenhagen	23,185
United Kingdom and Irish Free State.....	28,168
Trieste	2,387
Buenos Aires.....	15,550
Sao Paulo	7,272
Montevideo	2,263
Havana	3,416
Mexico	4,677
Miscellaneous	9,089

Total 165,122

Tractor exports from the United States totaled 7420 and 3292 from the Ford Motor Co. of Canada, giving a total tractor foreign business, including Canada, of 10,712.

Total exports of cars and trucks from the United States of 127,132 in the first ten months of this year compare with totals of 87,015 for all of 1922, and 57,764 for 1921.

The effect of the Japanese earthquake on Ford business is shown in the monthly miscellaneous totals under which Japan is grouped. For October miscellaneous showed a total of 2030, which compares with 675 in September, practically all of which gain is ascribed to Japanese buying of vehicles for relief and reconstruction work.

All Plants Report Gains

Gains in export business are reflected in the reports of all plants. Barcelona business suffered in the mid-year months, due to labor difficulties which have since been disposed of, the plant now operating at an approximate annual rate of 15,000. The Cork plant, which changed over from tractor to car and truck production in July, shows a total of 1120 assembled since then, all of which are for distribution in the Irish Free State.

Ford Motor Co. of Canada, Ltd., exported 31,370 and sold 37,990 in Canada, making a total of 69,360 produced by the company.

No action has been taken by the company relative to the establishment of additional assembly branches in foreign countries, the Chile plant being specifically indicated as a point on which no decision has been made. The company is

looking forward to considerable development of business in Russia during the present year, tractor outlook being regarded as especially promising.

General export markets are expected to show steadily increasing absorption during the year. The exchange situation presents the most serious problem generally, but this is steadily improving, and export business is expected to keep pace.

Ford's Domestic Output

DETROIT, Nov. 26—Domestic production of the Ford Motor Co. for the week ending Nov. 20 was 40,226 cars and trucks, 1713 tractors and 134 Lincoln cars. The large reduction in Lincoln totals is ascribed to change under way at the factory.

Court Lifts Injunction Against Advanced Motors

NEW YORK, Nov. 26—Supreme Court Justice Cohalan has vacated the temporary injunction obtained by Attorney General Sherman restraining the Advanced Motors Corp. from continuing to sell stock. An examination of the books showed that less than 2 per cent of the stock had been sold, and that the unsold stock was intact in the treasury.

According to the evidence, Salvatore Barbarino, the designer, has resigned as president and has been succeeded by Walter Lawson Adams. Charles Beadon, who, it was charged, was to get 1,500,000 of the 5,000,000 shares of stock for promoting the company, is declared never to have been either a stockholder or officer of the company. Claim is made that the company had bought out the Richelieu Motors Co. and has a plant at New Haven, Conn.

Motor Wheel Starts Work on Additional Gier Plant

DETROIT, Nov. 26—Motor Wheel Corp. has started work on an addition to the Gier pressed steel unit of their factories, which will be used for steel storage, shipping department, wheel assembly and priming department. These departments were formerly located in the main plant, but requirement of space for production has necessitated their removal to a separate building.

The addition will be 380 by 100 ft. and will cost about \$70,000. The company is now using the recently completed building which was started by the Government during the war for war work. Settlement of claims with Motor Wheel for war work recently was followed by the completion of this building, giving the company important storage space.

LEE TIRE IN CANADA

MONTREAL, Nov. 26—The Lee Puncture Proof Tire Co. of Canada, Ltd., a subsidiary of the Lee Tire & Rubber Co. of Conshohocken, Pa., is about to operate in the Dominion. It will erect a one-story plant with a capacity of 250 tires a day in the vicinity of Montreal.

Akron Experienced Banner Output Year

Prices Lower Than in 1920,
Which Accounts for Reduced
Production Value

AKRON, Nov. 28—The tire industry during the past year exceeded in unit production any other year in the history of the industry here, according to figures announced by the Akron Chamber of Commerce at its annual meeting.

Total rubber output for the year, of which more than 80 per cent is automobile tires, amounted to \$334,861,000 as compared with \$544,000,000 in 1920, which was the high point in the history of the industry.

In view of the fact that prices of all rubber goods show reductions of from 20 to 35 per cent under the 1920 figure, and in some instances are even lower, the new figure indicates the high water mark as far as production is concerned.

The same industry during the year employed 41,000 of the 50,000 men employed in the city's industries, while the payroll of the industry amounted to \$64,637,000, which is practically the same amount as paid during the previous year.

The total payroll for all industries amounted to \$79,934,000 as compared with \$75,000,000 reported for the previous year. Total capitalization of all industries dropped, however, from \$390,000,000 shown for 1922 to \$384,000,000, while the capitalization of the rubber industry dropped from \$345,000,000 to \$325,000,000.

More Stable Year Predicted

AKRON, Nov. 27—That 1924 will be one of the most prosperous years, in a stable way, for the tire industry is the prediction of Harvey S. Firestone, president of the Firestone Tire & Rubber Co.

In a speech before the Rotary Club, Firestone also stated that his company has increased its employment and production during the last few months and that the same thing is being done in other tire factories. He said:

I feel certain that we can look forward to a very good year in 1924, because the difficulties which the rubber industry had to go through have about been brought to an end.

That prosperity, of course, will be a very stable and substantial kind and will be lacking the ear marks which in the past have been associated with our prosperity.

Prices of our product, which have been going down for the last few years, have reached their bottom. With production increasing I can see nothing but good times.

We have added approximately 1000 men during the last two months and I understand that the other companies have done the same thing. This process will probably continue for some time to come.

A review of the Akron industry shows that tire production has been increased more than 6000 tires a day during the last two months and indicates that production will not reach its height until some time in January.

Men of the Industry and What They Are Doing

Henri Perrot Coming

Henri Perrot, French four-wheel brake expert, will be a passenger aboard the French liner Paris when she sails for New York on Dec. 1. Perrot, who has placed the American rights for his brakes with the Bendix company, will attend the New York show and will follow this with visits to American factors, numbers of which, he declares, have signed contracts for the use of his brakes.

Albert Champion Returns Home

Albert Champion, president of the A. C. Spark Plug Co. of Flint, Mich., returned from his European trip on the Berengaria. Champion reports the European motor industry 300 per cent better from a manufacturing standpoint than last year. His own English factory is producing 70,000 spark plugs daily and the French plant is turning out 3000. It is planned to double this production next year.

Smith President of Delmore

George Drake Smith has been elected president of the Delmore Motors Corp. of New York City. Smith formerly was general sales manager of the Steinmetz Electric Motor Car Co. of Baltimore and has been active in the automotive and electrical field for years. The Delmore corporation is manufacturing a three-wheel two-cylinder parcellmobile for commercial purposes.

Van Wagtendonk Export Manager

William J. van Wagtendonk has been appointed manager of the export department of the Gibson Co. of Indianapolis, succeeding A. W. Webber, who has been made buyer for the concern. The new export manager has traveled extensively in British India, China, Japan, Africa and Europe.

Verne E. Burnett Promoted

Verne E. Burnett has been promoted from advertising manager of the Cadillac Motor Car Co. to the position of secretary of the Institutional Advertising Committee of General Motors by Vice-President Alfred H. Swayne. Burnett will be succeeded at Cadillac by William W. Lewis, who has been central district manager for the company. In his new position, Burnett will assist in the development of the national advertising campaign to acquaint the general public with the plan, purposes and policies of General Motors.

Pennsylvania Vice-Presidents

D. D. F. Yard of New York, C. F. Kent of Kansas City and J. F. Madden of San Francisco have been made second vice-presidents of the Pennsylvania Rubber Co. The promotions involve no change

in residence or duties, but are made under a plan recognizing ten consecutive years of managerial service.

Metzger Named Sales Manager

George Metzger, formerly of the Metzger Welding Co., has been named as general sales manager of the Cincinnati Screw Co.

Siekman with Brotherton

Charles A. Siekman, for nine years in charge of advertising and publicity of the Oliver Chilled Plow Works of South Bend, Ind., has joined the Brotherton agency of Detroit. In his new connection Siekman will continue to direct the advertising of the Oliver company.

British Cement Makers Inspect U. S. Highways

DETROIT, Nov. 24—Wayne County highways were studied this week by a group of visiting British cement makers as part of an investigation tour of American roads the study of which will be incorporated into plans for highway improvement and construction in the British Isles. Great Britain is to spend \$200,000,000 in public works for the relief of unemployment, a large part of which will be in improved and new highways.

The British party included Percy Malcolm Stewart, F. Halford, H. H. D. Anderson, L. Lister-Kaye, E. A. Browne, A. C. Davis, General A. E. Critchley, E. R. Moxey, S. G. Robinson and E. Posselt. C. R. Ege, Chicago, and J. W. Johnston, New York, highway engineers, escorted the visitors who had already inspected the highway systems of New York and Illinois.

The visitors were guests of the Wayne County highway commission at dinner while here, which was attended also by the following Detroit guests: Edward N. Hines, John C. Lodge, Harold H. Emmons, Roy D. Chapin, Howard C. Meredith, Col. Sidney D. Waldon, Thomas P. Henry, A. F. Bement, Charles L. Weeks, Capt. W. S. Gilbreath, O. O. Stone, John W. Boardman and Emil Stroh.

Naval Aircraft Expert Now on Embassy Staff

WASHINGTON, Nov. 28—Commander Jerome C. Hunsaker, leading aerodynamic expert of the United States Navy, has been appointed assistant naval attaché in the American embassy at London.

He was formerly associated with the national advisory committee for aeronautics, and established the first course in aerodynamical engineering in this country at the Massachusetts Institute of Technology and supervised the design and construction of the NC-4 and the ZR-1, now known as the Shenandoah.

Best Show Promised at New York Armory

Advertising Managers of N. A. C. C. Become Enthusiastic Over Outlook

CLEVELAND, Nov. 26—Methods by which automobile manufacturing companies can promote the success of the national show in New York were considered by the advertising managers of the N. A. C. C. at their session here last week. It was agreed that all possible assistance should be given.

After the advantages of the huge artillery armory in the Bronx as an exhibition hall had been outlined by Edward S. Jordan and George M. Graham, the advertising men manifested distinct enthusiasm over the outlook. Several of them declared they had been told by the New York distributors of their company that it promised to be the greatest selling show in history because attendance will be confined to those who have a genuine interest in motor cars.

Jordan suggested that a snappy slogan be worked out for use in all advertising used in connection with the show. This slogan would emphasize the fact that the world's biggest automobile show will be held in January in the biggest building in the world so far as unobstructed floor space is concerned. The advertising men were asked to submit suggestions, and the best one will be selected by the N. A. C. C. advertising committee.

Discourage Defensive Attitude

It was agreed that the somewhat defensive attitude which has been adopted in connection with holding the show in the Bronx should be abandoned and that the New York public should be sold on the actual facts which are that the new site will permit a bigger and better show than ever was held before. When this argument is driven home, it is considered certain everyone really interested in motor cars will gladly go up into the Bronx to see the displays. The huge armory is ideal for the purpose, and the next New York show will be adequately housed for the first time in its history.

HEADS MICHIGAN HAULERS

TOLEDO, Nov. 27—Frank G. Schmidt of this city, an official of the Liberty Highways Co., truck line operator, who is president of the Ohio Association of Commercial Haulers, has been elected president of the Michigan Association of Haulers. Schmidt said the associates were working to place the truck transportation business on a firm basis, realizing that big development is ahead.

First 10 Months Show U. S. Exports Doubled

During That Period 125,966 Cars
and Trucks Were Shipped
Overseas

WASHINGTON, Nov. 26—During the first ten months of this year a total of 125,966 passenger cars and trucks were exported from the United States. This figure—practically doubling the 63,645 units shipped during the same period in 1922—is given in the announcement today by the Automotive Division of the Bureau of Foreign and Domestic Commerce of the overseas shipments from this country during October.

The October exports consisted of 10,-

464 passenger cars valued at \$8,088,832 and 2311 trucks valued at \$1,415,419. The passenger car shipments were two less than the 10,466 shipped during the preceding month, but the value in October was much higher than the \$7,585,570 of September.

Increased truck shipments were recorded in both the lowest and the highest classification, the comparative figures showing a reduced total in the medium weight units:

	October	September
Up to 1 ton.....	1,955	876
1 to 2½ tons.....	315	250
Over 2½ tons....	106	34

The October movement of parts, not including engines and tires, was slightly reduced, the valuation of \$5,112,467 in September compared with \$4,827,896.

Ford Estimated at 9000

NEW YORK, Nov. 26—Although offi-

cial announcement of the total assembly of Ford vehicles in foreign assembly branches during October has not been made, it is understood from incomplete reports, that the number was about 9000.

Canadian Exports

OTTAWA, Nov. 26—The Dominion Bureau of Statistics announces that Canadian made trucks shipped during October reached a value of \$441,000, compared with \$107,000 in the corresponding month a year ago. Total value of truck exports for the year ended October, 1923, was \$3,569,000, as against \$1,034,000 in the preceding year.

Exports of passenger cars were valued at \$3,081,000 in October, against \$2,365,000 in the corresponding month in 1922. During the twelve months ended Oct. 31, automobiles to the value of \$29,819,000 were exported, as against \$17,231,000 in the previous twelve month period.

Exports, Imports and Reimports of the Automotive Industry for October of Current Year and Totals for Ten Months Ending October 31

EXPORTS								
Month of October				Ten months ending October 31				
	No.	Value	No.	Value	No.	Value	No.	Value
	1922		1923		1922		1923	
Automobiles, including chassis.....	7,253	\$5,905,409	12,788	\$9,522,963	63,854	\$49,234,967	126,132	\$86,512,079
Electric trucks and passenger cars.....	16	21,742	13	18,712	209	305,465	166	248,955
Motor trucks and buses, except electric:								
Up to 1 ton.....	537	257,809	1,955	777,047	6,212	2,526,937	15,723	5,743,643
Over 1 and up to 2½ tons.....	188	265,352	250	339,303	2,046	2,561,769	3,429	4,095,144
Over 2½ tons.....	66	266,794	106	209,069	613	1,714,949	715	1,752,478
Total motor trucks and buses, except electric.....	791	789,955	2,311	1,415,419	8,871	6,803,655	19,867	11,591,265
PASSENGER CARS								
Passenger cars, except electric:								
Value up to \$500 (inclusive).....	.....	.....	3,387	1,200,976	.....	.....	45,014	15,938,924
Value over \$500 and up to \$800.....	3,853	2,005,124	3,016	1,965,571	34,839	16,951,862	24,612	16,282,166
Value over \$800 and up to \$2,000.....	2,408	2,587,081	3,807	4,207,302	18,226	20,112,829	34,174	36,108,890
Value over \$2,000.....	185	501,507	254	714,983	1,709	5,061,156	2,299	6,341,879
Total passenger cars, except electric.....	6,446	5,093,712	10,464	8,088,832	54,774	42,125,847	106,099	74,671,859
PARTS, ETC.								
Parts, except engines and tires*.....	12,690,734	3,166,408	.....	.....	132,104,848	31,576,730	.....	.....
Automobile unit assemblies*.....	.....	.....	505,475	89,557	.....	.....	23,403,056	3,716,896
Accessories, parts*.....	.....	.....	20,082,657	4,827,896	.....	.....	197,283,696	45,529,139
Automobile service appliances (not elsewhere specified)*.....	.....	.....	373,351	195,477	.....	.....	1,556,149	819,763
Station and warehouse motor trucks.....	5	5,822	44	21,626	128	131,947	196	95,868
Trailers.....	57	21,229	29	7,286	413	185,692	931	319,886
Airplanes.....	4	98,000	2	5,000	36	156,130	44	305,151
Parts of airplanes, except engines and tires*	275,199	185,205	29,090	11,849	468,215	261,271	260,360	49,052
BICYCLES, ETC.								
Bicycles and Tricycles.....	1,866	11,867	2,872	19,149	9,094	108,330	23,640	189,049
Motorcycles.....	1,295	295,333	1,589	380,246	13,099	3,364,113	18,792	4,456,426
Parts, except tires*.....	179,884	95,295	279,806	149,525	2,451,508	1,316,398	2,739,142	1,410,439
INTERNAL COMBUSTION ENGINES								
Stationary and Portable Engines:								
Diesel and semi-Diesel.....	12	12,574	12	27,320	165	143,882	880	379,871
Other stationary and portable.....	2,562	314,241	.....	.....	21,076	2,720,405	.....	.....
Not over 8 hp.....	.....	.....	2,004	166,377	.....	.....	23,808	2,229,587
Over 8 hp.....	.....	.....	107	107,485	.....	.....	1,939	1,080,639
Automobile Engines.....	3,392	346,163	.....	.....	40,913	4,561,640	.....	.....
Motor trucks and buses.....	.....	.....	9	2,561	.....	.....	2,956	338,187
Passenger cars.....	.....	.....	3,247	528,972	.....	.....	34,573	4,437,969
Tractors.....	.....	.....	301	107,036	.....	.....	2,365	570,396
Aircraft.....	.....	.....	5	7,860	101	63,619	42	41,617
Accessories and parts*.....	504,088	265,290	594,442	288,567	5,867,107	2,291,421	6,605,600	2,893,650
IMPORTS								
Automobiles and chassis (dutiable).....	94	128,597	228	138,542	363	626,196	742	761,252
Other vehicles and parts for them.....	.....	54,103	.....	178,519	.....	589,336	.....	1,678,791
REIMPORTS								
Automobiles (free of duty).....	262	403,456	53	131,801	1,379	2,274,728	2,186	2,541,719

* Pounds.

No Undue Inflation Seen in Big Output

M. A. M. A. President Says Production Reflects Demand for Transportation

NEW YORK, Nov. 26—Directors of the Motor and Accessory Manufacturers Association see no evidence of undue inflation in the unprecedented production of cars and trucks which this year will exceed 4,000,000 as against a total of 2,527,000 in 1922.

This was the sentiment that prevailed at the monthly meeting of the directors at which reports from 300 of the members showed that original equipment sales in October rose to \$53,803,350, an increase of 16.40 per cent over September.

Following the meeting President W. O. Rutherford declared that "the unprecedented business of the automobile industry this year is a direct reflection of the enormous demand for motor transportation, and a tribute to the high value and efficiency which the automobile represents in the present economic structure. The individual and social utility of the automobile can no longer be challenged successfully.

Continuing, Rutherford said:

Two of the strongest elements of strength in the automotive industry are the high development of mass production, owing to volume markets, and the margin of safety due to the year-to-year normal replacement market now assured. Elimination of waste and reduction in cost of manufacturing and distribution are now recognized as essential for permanency and the leaders of the industry have successfully worked out many problems along these lines in the past few months.

With a production of 2,500,000 cars in 1922 and 4,000,000 in 1923 and with the average car lasting five or six years, it can readily be seen that the replacement market alone, without a single new user of automobiles, affords a wide area for productive and marketing effort. But there are new users in increasing numbers. More than that, the parts and units of the cars in use must be repaired and replaced.

Company Loses Claim for War Risk Premium

MOLINE, ILL., Nov. 28—Illinois manufacturers, who accepted Government and allied powers' contracts for war materials, have been affected by recent rulings of the Mixed Claims Commissions of the Lusitania and other cases, involving damages incurred by German war losses.

The Moline Plow Co., with a claim for \$25,000 for premiums paid on war risk insurance, virtually has lost that claim by the ruling of the commission that it would consider no claims in which actual losses were not incurred.

The commission held that war risk costs were passed eventually to the consumer, and that such premiums were not items in this hearing.

A claim of the Moline Plow for \$50,-

000 worth of supplies in Germany, seized at the time of the break between the United States and the Central Empire, is still pending, however.

The Avery Co. of Peoria has a similar claim for \$22,700, and the Acme Harvesting Machine Co. has a suit for \$8,586.

Another war-time claim now in Washington is that of the Joliet Forge Co. for \$85,000 against the Emergency Fleet Corp. This is for special machinery purchased to fulfill a contract for 6000 tons of forgings, cancelled with the armistice. The first claim of \$140,000 had been adjudicated by agreement to the lower figure.

Rub-Tex Co. Purchases Factory of Lomer Tire

INDIANAPOLIS, Nov. 28—The Rub-Tex Co. of this city, maker of rubber composition battery boxes, rubber mats and other rubber products, has bought the plant and equipment of the Lomer Tire Co., of Newcastle, Ind., and will begin to manufacture Rub-Tex products there at once. The new plant has floor space of 36,000 ft. and is completely equipped with tire-making machinery which has never been used to any extent.

A new addition is also being built at the Indianapolis plant, and new machinery for this has already been bought, which will increase the output of this factory at least a third. The Newcastle plant with the new addition here will permit double the output heretofore maintained. All this year Rub-Tex has operated on a 24-hour schedule, supplying battery and motor car manufacturers, and also has done an extensive business with jobbers.

Sperry Named President of New American Parts

LA SALLE, ILL., Nov. 28—The American Automobile Parts Co. has been reorganized with the election of the following officers: P. F. Sperry, Chicago, president; J. L. Bayne, Ottawa, vice-president; F. V. Johanas, Toluca, secretary, and R. L. Heydacker, Rochelle, treasurer.

The officers were instructed to issue stock certificates to all those persons who subscribed during the trusteeship, Dec. 1, 1923, having been fixed as the final date for such privilege to join the reorganized company. Subscribers are limited to shareholders in the American Parts Corp. The company controls valuable patents and derives its income from royalties from radiators for motor vehicles.

DURANT NEW YORK BRANCH

NEW YORK, Nov. 26—Durant Motors, Inc., will open a factory branch in New York City to handle Star and Durant cars instead of having them distributed through the Poertner Motor Car Co., which has had the distributorship. As yet the Poertner company has not announced its future plans.

Committee Selected for Roads Congress

Chapin Is Chairman of Unit to Handle Pan-American Highway Meeting

NEW YORK, Nov. 26—The Pan American Highway Mission will be the official title of the body that will handle the Pan American highway congress to be held in Washington next June. This was decided upon at a joint meeting held in this city of representatives of Government, automotive, road machinery, road material and banking interests, and presided over by J. Walter Drake, assistant secretary of the Department of Commerce.

The meeting also made its selection of an executive committee to handle the congress, selecting as its chairman Roy D. Chapin, vice-president of the National Automobile Chamber of Commerce, whose associates will be W. A. Beatty of the Austin Manufacturing Co. and Fred I. Kent of the Bankers Trust Co. The project will be managed by S. T. Henry, vice-president of the Allied Machinery Co.

Representatives of Industry

Representing the automotive industry at the meeting, besides Chapin, were Alfred Swayne of the General Motors Corp.; A. J. Brosseau of Mack Trucks, Inc., and Alfred Reeves, George Bauer and Pyke Johnson of the N. A. C. C.

Decision was reached to invite forty delegates from the Pan American countries to attend and make an intensive "shirt-sleeves" study of highways and highway transport. These delegates will spend three or four weeks in this work. They will be taken to States whose climatic and geographical conditions compare with their own countries and see first hand how roads are built and maintained.

They will visit big industrial plants and watch the construction of automobiles and tires; they will be given an opportunity to study motor transport in both country and cities, and when they are ready for the Pan American highway congress they will understand thoroughly the subjects up for discussion. Their expenses will be paid by private subscription. The details of the trip will be handled by the Highway Education Board in this country.

To Promote Closer Relations

The objective of the course is the promotion of closer relations between the United States and the other countries in the Americas. It is felt that the visitors, after studying motor transport and highway construction from all angles, will be able to go back home and report their observations, so that the Pan American countries can profit by the mistakes this country possibly has made in reaching the present stage of motor transport and highway building.

Indiana Producers Revive Association

Its Activities May Include the
Carrying On of Trade Ex-
tension Tours

INDIANAPOLIS, Nov. 28—Representatives of fifty Indiana automotive manufacturers have organized the Indiana Automotive Manufacturers Association, which will operate as a trade extension and promotion body for the automotive industry of the State.

This is really a revival and reorganization of the old Indiana Automobile Manufacturers Association, which until nine years ago conducted trade extension tours into four States and finally accomplished the Indiana-Pacific tour which founded the Lincoln Highway and extended Indiana trade into all western States.

Col. Will H. Brown of the Nordyke & Marmon Co. has been elected president. Vice-presidents are L. E. Porter, S. F. Bowser Co., Fort Wayne; Bert Barrows, McFarland Co., Connersville; F. F. Chandler, Ross Gear & Tool Co., Lafayette; J. F. Hunt, Hunt Porcelain Co., Kokomo; J. I. Farley, Auburn Motor Car Co., Auburn, and C. A. Maris, Adjustable Bearings Co., Brazil. Lon R. Smith is secretary, and George T. Bryant, Robert I. Hassler, Inc., treasurer.

Trip to New York Show

The first activity of the association will be to charter a special train to the New York show, with a probable dinner there for metropolitan section dealers of Indiana concerns. Possible motor tours into the South next summer are among other activities being discussed as a means for extending trade for Indiana makers of automotive products.

Headquarters have been established in the Wild Building, this city, and many manufacturers who were not represented at the organization meeting are expected to join the new trade group which plans even greater activities than featured the old association.

Allied Motor Commerce Will Hold Convention

INDIANAPOLIS, Nov. 27—Allied Motor Commerce of Indiana will hold its second annual convention here Friday, Dec. 6, at the Hotel Lincoln. S. H. Hadden, secretary of the organization, has announced that but two sessions will be held—a morning and afternoon meeting, with few papers and plenty of round table discussion of facts that vitally interest operators of commercial vehicles and the highways which they use.

The question of "Commission Control of Commercial Hauling of Passengers and Freight" will be handled by Hadden, who has collected facts of results where commission control is in effect.

The Indiana highway system will be set forth by Chief Engineer Gray of the

Indiana State Highway Department, who will show what roads and what types of construction the department plans for 1924.

Harry Negley, a member of the Advisory Committee which has conducted the affairs of the organization, will give views and facts regarding types of fair statutory regulation to which the motor industry of this vicinity leans.

Fageol Given Sole Right to Use of "Safety Coach"

CLEVELAND, Nov. 26—Announcement is made by the Fageol Motors Co. of Ohio that it has been advised by the United States Patent Office that the latter has granted the exclusive use of the words "safety coach" as a trademark to the Fageol Motors Co. of California and the Fageol Motors Co. of Ohio, under registration No. 175,223, as applied to motor vehicles used for the transportation of passengers.

This registration, under the laws of the Federal Trade Commission also protects both companies from the use of words of similar sound or meaning when applied to a similar product, which would include such expressions as "safety bus" and "safety stage."

Lumber Orders Forecast Bigger Automotive Year

ATLANTA, Nov. 26—Manufacturers in the Atlanta lumber market advise that orders for thicker dimensions of ash, maple and elm being placed by the automobile and body trades of the North and East, for delivery the first quarter of the year, indicate that the manufacturers are looking for a still greater automobile production year in 1924 than was the case in 1923, in spite of the great record established this year.

Orders for first quarter delivery are substantially greater than last year, and all mills in the South are producing at capacity, unable to accumulate reserve stocks because of the demand.

Prices for thicker dimensions have advanced again, and are 5 to 8 per cent higher than five or six weeks ago, with the tendency still upward.

Factory Executives Help Plant Management Course

DETROIT, Nov. 28—Many executives of Lansing factories will give their services in the second annual course on factory management, held under the auspices of the industrial department of the Lansing Y. M. C. A.

Those participating are E. H. Wildt, C. C. Carlton, J. Edward Roe, C. E. Bement, E. A. Meyers, G. L. Brown, Donald E. Bates, C. Carpenter, M. R. Carrier, W. N. Sweeney, Robert C. Rueschaw, Thomas O'Brien, A. A. Lauzun, Harry L. Conrad, C. L. Poole, Cyrus J. Rath, F. D. Longyear, M. H. Wilson, Hugo B. Lundberg, Hugh E. McGivern, John M. Scott, F. W. Openlander and A. B. C. Hardy.

Post Office Wants Motor Rural Routes

Postmaster General Recommends
Supplanting of Horse-drawn
Vehicles

WASHINGTON, Nov. 28—Recommendation that motor equipment be used more extensively, especially on the 44,439 rural mail routes, is an outstanding feature of the Postmaster General's annual report to Congress, which carries with it a recommendation that Congress enact legislation providing for the establishment of motor routes, at the present time technically listed as "horse-drawn routes."

Under existing laws, passed in June, 1918, the use of motor equipment on mail routes is specifically forbidden unless a certain percentage of the patrons make a written petition for same. The theory under which the law was passed was that a horse-drawn mail wagon was more dependable, especially in sections where the roads were not good.

Would Cut Down Routes

Back of it all, however, is the political reason that, if the 44,439 mail routes were motorized, approximately half of them would be eliminated.

The figures of the Department show that out of the 44,439 rural mail routes only 857 at the present time are motor routes. The average length of the horse-drawn route is 26.244 miles, and the motor routes' average is 54.56 miles. Only twenty-three motor routes were put in service last year.

In order to remedy these conditions, the Postmaster General recommends that he be given authority, in his discretion, to establish motor-vehicle rural routes of not less than thirty-six nor more than seventy-five miles in length, carriers serving such routes who furnish and maintain their own automobiles to receive compensation of not less than \$2,160 and not more than \$2,600 per annum.

The report shows that Government-owned motor trucks are now used in 417 cities, being employed chiefly in transporting mail from post office to sub-stations and in the collection of letter box mail.

The appropriation for vehicle service covering both Government-owned and contract services for the fiscal year ending June 30, 1923, was \$15,500,000. Expenditures for the year were \$15,071,097.

Good Air Mail Future

In speaking of the future of air mail service, the report states that "the success of the service is dependent upon night flying, and recent demonstrations in night flying made on Aug. 21 for four days between New York and San Francisco demonstrate that it is feasible and practicable to operate airplanes over properly lighted and prepared airways."

FINANCIAL NOTES

American Chain Co. reports net earnings of \$1,412,644 and net income of \$1,020,267 for the quarter ended Sept. 30. This is equivalent to \$3.38 a share earned on the 250,000 shares of no par value common stock, after allowing for dividends on the Class A shares. For the nine months of this year the company reports net income of \$2,738,669, which, after Class A dividends, was equal to \$8.90 a share on the common. A profit and loss surplus of \$8,643,474 as of Sept. 30 is reported. The balance sheet on Sept. 30 showed net current assets of \$14,645,538, against current liabilities of \$2,511,810.

Paige-Detroit Motor Car Co. stockholders have approved an increase in the common capital stock from \$4,000,000 to \$8,000,000, consisting of shares of \$10 par value each. It is expected that part of the increased capital will be used for the payment of a 50 per cent stock dividend. The directors also declared the regular quarterly dividend of 3 per cent on the common and 1½ per cent on the preferred, both being payable Jan. 2 to stockholders of record Dec. 15.

Michigan Securities Commission accepted the following applications during October: Ever Hot Heater Co., Detroit, \$100,000 preferred stock, \$50,000 common stock; Precision Speedometer Co., Detroit, \$150,000 common stock; Rapid Heater Co., Grand Rapids, \$38,000 preferred, 4400 shares non-par stock at \$5; entire issue of \$50,000 preferred and 5000 shares common validated; Packard Electric Co., \$50,000 7 per cent first mortgage gold bonds.

American Chain Co. has declared an initial dividend of \$1.50 on the common, payable Jan. 2 to stock of record Dec. 21; also its regular quarterly dividend of 50 cents on the Class A, payable Dec. 31 to stock of record Dec. 21.

Yellow Cab Manufacturing Co. has declared its regular monthly dividends of 41 2/3 cents a share on Class B stock, payable Jan. 2, Feb. 1 and March 1, 1924, to stock of record Dec. 20, 1923, Jan. 21 and Feb. 20, 1924.

Willys-Overland Co. has notified the New York Stock Exchange of a proposed reduction in the par value of common stock from \$25 to \$5 a share, thus reducing the authorized issue from \$75,000,000 to \$15,000,000.

Pierce-Arrow Motor Car Co. has declared the regular quarterly dividend of \$2 per share on the prior preferred stock payable Jan. 2 to holders of record Dec. 15.

McCord Radiator & Manufacturing Co. has declared its regular quarterly dividend of 75 cents on Class A stock, payable Jan. 2 to stock of record Dec. 20.

Chicago Motor Coach Co. has declared its regular quarterly dividend of 1½ per cent on the preferred stock, payable Jan. 2 to stock of record Dec. 20.

Buda Co. has declared its regular quarterly dividend of 1½ per cent, payable Dec. 1 to stock of record Nov. 20.

HUPP AUSTRALIAN SHIPMENT

DETROIT, Nov. 23—What is perhaps the largest single shipment of medium priced automobiles ever sent abroad left the Hupp Motor Car Corp. in two sections recently when 136 Hupmobile open and closed models and chassis—about thirty freight car loads—were started on

their way to Dalgety & Co., Ltd., distributor at Melbourne, Australia. It was expected by factory officials that all the cars would be shipped from New York on the same boat. The consignment, when laid down in Australia, represents approximately \$250,000 worth of motor cars and chassis.

Cross-Country Vehicle Urged in Army Report

WASHINGTON, Nov. 27—Extension of experimental work in connection with heavy cross-country motor vehicles and light power carts has been recommended by Major Gen. Charles S. Farnsworth in his annual report to the Secretary of War. It is expected that sufficient appropriations will be forthcoming for the development of these carriers.

General Farnsworth points out that the Society of Automotive Engineers is cooperating with the Army in this work. The Ordnance Department developed a small cross-country power cart of about 450 pounds capacity, weighing not over 900 pounds.

These carts are designed to carry machine guns, 27 mm.; light mortars, ammunition and communications equipment. The Infantry Board tested several experimental types recently and made favorable reports. However, defects were indicated during the tests and further developmental work will be required to eliminate them.

Mar Tan Engine Maker May Move to Illinois

PEORIA, ILL., Nov. 28—Harry E. Schuler, secretary of the Mar Tan Motor Manufacturing Co. of Milwaukee and also of the Schuler Motor Car Co. of the same city, has been in Peoria relative to moving the factories from Milwaukee to this place.

The Schuler car weighs 800 pounds and sells for \$245. It is equipped with the Mar Tan engine.

The companies are leaving Wisconsin because of the unreasonable tax burdens placed upon manufacturers, it being stated that these have increased 179 per cent since 1912.

Unused War Equipment Costly to Government

WASHINGTON, Nov. 28—The Government sustained a loss of 62 per cent on its unused automobile equipment and supplies which were left over at the conclusion of the war, and which have been disposed of since then at an average of 38 per cent of their original value, according to the annual report of Assistant Secretary Dwight Davis of the War Department.

A total of \$944,579,320 has been salvaged by the Government in the sale of war surplus materials since the war, the report shows. The cost value of property still on hand is placed at \$117,828,248, of which \$72,562,000 is represented by the cost of lands and buildings.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

General business conditions continue "spotty." Last week's stock market gave further evidence of reviving confidence, while commodity prices continued to decline, and a quieting down was reported in various branches of trade.

A notable feature of the week was the sudden buying movement in pig iron, which resulted in bookings estimated at 500,000 to 700,000 tons. This revival of activity has brought significant price advances at several points.

The rise in the price of raw cotton continued, carrying the cash quotation on Monday of this week to 36.15 cents a pound, the highest in more than three years. Corn declined slightly, while wheat advanced early in the week, but later receded, closing fractionally higher.

Car loadings during the week ended Nov. 10 numbered 1,036,067, representing a small increase over the preceding week, and a gain of 91,881 over the corresponding week last year. Railroad earnings so far reported for October show a material increase over those for September.

Production of crude petroleum in the week ended Nov. 17 averaged 2,224,300 barrels daily, comparing with a daily average of 2,238,750 for the preceding week, and 1,645,000 for the corresponding week last year.

High Cotton Consumption

The consumption of cotton by domestic mills in October amounted to 541,826 bales, the highest figure recorded since last June, while the month's exports of 781,722 bales were larger than in any month since November, 1922.

The Fisher index of wholesale commodity prices declined again last week, touching the year's low point at 151, as against 152 the week before. Dun's list of wholesale prices showed sixty-seven changes, of which forty-five were downward; while Bradstreet's food index receded from \$3.41 to \$3.37.

Further credit contraction was reflected in the statement of the Federal Reserve banks on Nov. 21, which showed declines of \$44,900,000 in discounted bills, \$17,000,000 in United States securities, \$41,000,000 in total deposits, and \$40,000,000 in the circulation of Federal Reserve notes. Holdings of purchased bills increased \$16,100,000 and total reserves \$3,500,000, while the reserve ratio rose from 75.6 to 77.1 per cent.

Loans Increased

Loans of reporting member banks increased \$9,000,000 during the week ended Nov. 14, while investments declined \$8,000,000. Net demand deposits increased \$147,000,000, and reserve balances with Federal Reserve banks \$47,000,000, while accommodations at Reserve banks declined \$35,000,000.

Both call and time loan rates were unchanged last week, the former at 4½ to 5 per cent and the latter at 5 to 5½ per cent.

Bureau of Standards Urges Headlight Law

Suggests Drafting Model for District of Columbia to Be Followed Generally

WASHINGTON, Nov. 28—A national headlight law for automobiles and motor trucks was recommended today by United States Bureau of Standard Engineers, testifying before the Senate traffic investigation committee. Automobile manufacturers, the experts told the committee, must do their share in remedying headlight conditions.

Figures presented to the committee estimated that 60,000 automobiles out of every 100,000 have glaring headlights. Among the factors which lead to glaring lights, the Bureau experts testified, were twisted lenses, improper focusing, unapproved lenses, improper tilt and too strong bulbs.

The ideal lens, W. Graham Cole of the National Safety Council said, is one that throws no light above 42 inches from the ground and is properly focused. The relation between proper lenses and proper focusing of bulbs was demonstrated by means of charts.

A recommendation was made that automobile manufacturers furnish with each car, or that lens manufacturers selling to a car user, furnish with each set of lenses, a detailed set of printed instructions for installing them. All manufacturers should be required to furnish such instructions, Dr. E. C. Crittenden of the Bureau of Standard declared.

It is proposed that the Bureau draft a model law for use in the District of Columbia and then urge the States to adopt it. The Federal Government can force passage of such a measure through the appropriation of Federal funds for Federal-aid highways. Should States refuse to adopt the model law, or one as good, these funds could be held up.

Suggest Improvements in Farm Motive Power

MADISON, WIS., Nov. 26—As a result of exhaustive tests conducted during the Wisconsin silo-filling season just closed, the prediction is made by F. W. Duffee, department of agricultural engineering, University of Wisconsin, that an enormous saving to farmers will be effected on the basis of the improvements suggested in motive power and accompanying equipment.

Fifteen manufacturers of tractors and silo-fillers cooperated with the university in the tests and furnished outfits for determination of efficiency. Principally under observation were the draft of cutters, advantage of anti-friction bearings, power necessary to elevate ensilage to different heights and power required for the separate operations of cutting and blowing. It was found, as the investigation proceeded, that an unexpected

factor entered into the work, namely, the relationship between the speed of the cutter, the tonnage per hour and the amount of power.

Wisconsin farmers cut and elevate approximately 8,000,000 tons of ensilage every fall, and there are about 105,000 silos on Badger farms. Professor Duffee predicts that in consideration of these facts, the sum of \$350,000 will be saved to farmers when manufacturers put into practice the improvements which have been suggested through the tests.

INDUSTRIAL NOTES

Crissey Tire & Rubber Co. has been chartered with \$300,000 capital and will construct a plant in Columbia, Tenn. for the manufacture of tires and inner tubes. It has been announced by R. B. Crissey, president of the company. A site has been acquired and construction of the plant is to start at an early date. The corporation is composed of a group of Columbia business men who have subscribed most of the capital stock.

A. E. Hill Manufacturing Co., manufacturer of Hilco headlight reflectors and other automotive devices, has moved into its new plant in Atlanta, Ga., where additional machinery has been installed to increase capacity. Production of the headlight reflector will be at the rate of 200,000 per year in the new plant, according to A. E. Hill, president.

Yellow Cab Interests Buy St. Louis Company

CHICAGO, Nov. 26—Chicago interests identified with the Yellow Cab Manufacturing Co. and the Yellow Coach Manufacturing Co. have purchased the Peoples Motorbus Co. of St. Louis and will reorganize it as the St. Louis Motor Bus Co. The company now has about forty buses in operation, and the new management proposes to add two a day until it has about 120 in service.

The new company will be capitalized with 35,000 non-par shares of Class A stock and an equal number of non-par shares of Class B stock. The Class A shares were taken by John Hertz, head of the Yellow enterprises, and associates at \$50 a share, with a bonus of one share of Class B stock for each five shares subscribed. The remaining 28,000 shares of Class B stock were used in acquiring the St. Louis company. The buses used in St. Louis will be those manufactured by the Yellow Coach Manufacturing Co.

COVERT PROPERTY SOLD

LOCKPORT, N. Y., Nov. 26—The property of the Covert Gear Co. has been sold for unpaid taxes for the year 1922, the assessment being \$2,399. The buyer was M. J. Noonan, a Niagara Falls lawyer. The company has two and one-half years in which to redeem the property by payment of the amount due. The sale has not affected the operation of the plant by the Covert company.

METAL MARKETS

Apparently every week that brings the end of the year nearer witnesses a more marked tapering off in the demand for steel products. Small as the tonnages involved in recently placed orders have been, they continue to diminish further. Specifications on pending contracts are also extremely light. Automotive steel consumers are by no means unmindful of their 1924 requirements, but they seem to consider prevailing market conditions the best possible vindication for their policy of hand-to-mouth buying.

While there is no marked weakness, soft spots are plentiful. With the possible exception of blue annealed, concessions of \$1 and more per ton from the generally named quotations are rather the rule than the exception in the sheet market. Leading producers of full-finished automobile sheets stand pat on the 5.35 cents base, but rumors have been heard lately of slight concessions by order-hungry smaller mills.

The large producers point out that in a \$42.50 sheet bar market it is impossible to make both ends meet if full-finished automobile sheets are sold at less than a 5.35 cents base. While this is generally conceded, the integrity of the \$42.50 sheet bar market is by no means looked upon as a certainty, at least not generally so. The example of the chief interest's sheet-rolling subsidiary in stocking sheet bars produced by one of its allied mills has not been followed by non-integrated sheet rollers so far.

Automotive purchasing agents, especially those of parts makers are not merely cautious, but more than ever bent upon analyzing prices microscopically, and they are not ordering a single ton more of any product than they require for immediate needs unless absolutely certain that there is no possibility of an early price recession. Hot-rolled strips are nominally quoted at 3 cents and even higher, but quite a few of the limited number of sales recently made are reported to have been made at 2.90 cents, and, in some instances, even as low as 2.85 cents. Amid the further shrinkage in demand which is generally looked for before the old year has given way to a new year, the range of prices is likely to widen.

This will be the natural result of some mills being more eager than others for what little business there is around. Such a disparity of quotations never endures for any length of time in the steel market. Usually either something unforeseen happens to remove all necessity of concessions or else the mills in a certain group follow the lead of individual price shavers and, as a rule, they make the cut more incisive.

Pig Iron.—The recent buying movement, in which automotive foundries took little part, was the first in many years that was not accompanied by a sharp upswing in prices. Now, however, blast furnace interests declare that the bottom has been reached, and price changes, if there be any, must be in the opposite direction.

Aluminum.—Market advances are always followed by a certain amount of activity. There are still some consumers anxious to get in under the wire although the new price has been chalked up by importers as well as the domestic producer. A shipment of Norwegian metal arrived the other day consigned to an importer representing British producers.

Copper.—Demand for wrought copper and brass products has calmed down. The copper metal market continues easy to feeble.

Calendar

SHOWS

- Jan. 5-12 New York, Annual Automobile Show, under the auspices of the National Automobile Chamber of Commerce, Eighth Coast Artillery Armory.
- Jan. 26-Feb. 2—Chicago, Annual Automobile Show, under the auspices of the National Automobile Chamber of Commerce, Coliseum and First Regiment Armory.
- Jan. 26-Feb. 2—Chicago, Annual Automobile Salon, Hotel Drake.
- Feb. 4-9—Chicago, Tenth Annual National Motorcycle, Bicycle and Accessory Show, Broadway Armory, under the auspices of the Motorcycle and Allied

Trades Association, A. B. Coffman, secretary.

FOREIGN SHOWS

- Dec. 1-10—Montevideo, Uruguay, Automobile Show, Buildings of the Rural Society.
- Dec. 8-19—Brussels, Passenger Cars, Trucks, Airplanes and Motor Boats, Aviation Palace.
- April 2-13—Barcelona, Automobile Exposition, under the auspices of the Confederación de Camaras Sindicales Espanolas del Automovilismo y Ciclismo, Palacio de Arte Moderno.

RACES

- Aug. 5 or 6—France, European Grand Prix.

CONVENTIONS

- Dec. 11-13—St. Louis, Convention of American Petroleum Institute, Hotel Statler.
- Jan. 5—New York City, Annual Meeting, Automotive Electric Association.
- Jan. 14-18—Chicago, Annual Convention and Show of the American Road Builders' Association, the former to be held in the Congress and the latter in the Coliseum.
- May, 1924—Detroit, International Motor Transport Congress under the auspices of the National Automobile Chamber of Commerce.

June, 1924—Washington, Pan American Highway Congress, under the auspices of the Pan American Highway Mission.

S. A. E. MEETINGS

- Dec. 13—Metropolitan Section, Vehicles for Package Delivery.
- Jan. 22-25—Annual Meeting of the S. A. E.—Detroit.
- Feb. 14—Metropolitan Section, Vehicle Depreciation.
- March 13—Metropolitan Section, Replacement Parts and Accessories.
- April 17—Metropolitan Section, Fleet Maintenance, F. W. Winchester.
- May 15—Metropolitan Section, What Roads and Steels Do to Automobiles.

Citroen to Purchase More Machinery Here

(Continued from page 1121)

Citroen states that he is always open to employ American engineers who can show him how to improve and lower the cost of his production, and at the present moment he has a post open for an American consulting engineer to take charge of his metal stamping plant, with Bliss and Toledo presses.

Citroen May Build in England

LONDON, Nov. 16 (by mail)—At a gathering this week of British dealers in Citroen cars, at which André Citroen was present, it was plainly hinted that preliminary action is being taken with a view to securing a plant in England to make this car for the British market, and so save the 33 per cent import duty.

Citroen stated that 3000 of his cars have been sold in England during 1923, and that if he had the facilities he could make and sell 6000 in this country in 1924.

Citroen pointed out that the cost of production in France is steadily increasing—wages in particular—and that all French makers except himself had been compelled to increase their prices in their home market.

A service depot at Hammersmith, London, originally built for the Ford Motor Co. has been taken over recently by Citroen. It is said to be the largest of its kind in England.

Barcelona Plans Holding Automobile Show in 1924

BARCELONA, SPAIN, Nov. 14 (by mail)—The Barcelona Automobile Exposition will be revived in 1924, the date having been fixed by the Confederación de Camaras Sindicales Espanolas del Automovilismo y Ciclismo as April 2 to 13. The first show in this city was held in the spring of 1922, but no show was staged in 1923.

The exposition building that housed the previous exposition—the Palacio de Arte Moderno—will be utilized, being divided into eleven different sections for

as many exhibitions of the various types of automotive, cycle and aviation products.

Contract blanks and space negotiations, as well as a synopsis of the plans, have been prepared by the show committee, of which the secretary is D. Narciso Masferrer, with offices at Rambla de Catalunya 41, this city.

Every Mile of Highway Has 4.61 Automobiles

WASHINGTON, Nov. 27—For every mile of public road in the United States there are 4.61 automobiles, a survey of road mileage figures compiled by the United States Bureau of Public Roads shows.

The total road mileage of public roads on June 1, this year, is placed by the survey at 2,940,378 miles. Figuring a total of 13,500,000 automobiles in the United States, the figures show that if they were evenly distributed there would be 4.61 automobiles on each mile of road.

While the figures include all public roads, the survey shows that on Jan. 1, 1922, there were 387,464 miles of surfaced roads.

Progress on the 1923 program has been such that the Bureau estimates that on Jan. 1, 1924 there will be a total of 430,000 miles of surfaced roads.

In the total mileage of public roads, Texas with 167,000 miles leads. Other States, well up in the list, are as follows: Oklahoma, 134,263; Kansas, 128,552; Missouri, 111,520; Minnesota, 107,103; North Dakota 106,523, and Iowa, 104,082.

Flies Nearly 9 Hours on 80 Gallons Gasoline

WASHINGTON, Nov. 27—The establishment of a new record for the Liberty motor has been announced by the War Department, in connection with gasoline consumption.

Flying a standard De Havilland 4-B plane, equipped with a Liberty motor, Capt. Clayton Bissell, at Bolling Field, flew for 8 hours and 49 minutes, establishing a new record, the Department announces, for sustained flight on an 80-gallon supply of gasoline.

Exhibitors Satisfied with Olympia Returns

LONDON, Nov. 12 (by mail)—With few exceptions, British makers who exhibited at the Olympia Show report favorably concerning the promise of business for 1924. Not since the show of 1919 have they been so satisfied with the number of privately placed orders and genuine inquiries. The majority of dealers, also, have placed contracts on a larger scale than hitherto.

The surprise was the number of orders and inquiries for the higher priced cars, although the largest volume of business was done in the type of four-passenger car with an engine of 12 to 14 hp. and selling at £300 to £400.

Disappointment is, however, expressed by those firms who expected a re-awakening of export trade; the business done in other than the home market again was very small.

The official figures of daily attendances of paying visitors show that all records, except that of 1919, were beaten, despite the discontinuance of a reduced fee after 6 p. m. on the first Saturday.

France Exported 21,780 Vehicles in Nine Months

PARIS, Nov. 16 (by mail)—During the first nine months of the present year France exported 21,780 passenger cars and trucks, having a total value of 567,262,000 francs and imported 6495 automobiles, valued at 45,278,000 francs.

The export figures show an increase of 9873 passenger cars, compared with the corresponding period of 1922, and a decrease of 1482 trucks. Great Britain stands at the head of nations taking French automobiles, with a total of 5920, followed by Belgian Luxemburg, with 3945; Spain, 2451; Algeria, 2339; Switzerland, 1888, and all other individual nations less than 1000. The United States took ninety-three French automobiles.

Of the 6495 passenger cars and trucks imported by France, the United States sent 5683, Italy supplied 655, the remaining 157 coming from twelve different countries.